$4.00 a Year

JAN 18 1937

50c a Copy

VETERINARY MEDICINE

FEBRUARY 1937

CONTENTS

Diagnosis of Brucellosis 60
Anatomy and Teachers of Anatomy 62
Rabies Control 62
Actinomycosis Yields to X-Ray Treatment 63
Treatment of Trichomoniasis of Cows 63
Salmonella Infections in Poultry 64
Selenium Poisoning in Animals 65
Passing the Stomach Tube 66
Treatment of Parasites in Horses 67
Incidence of Streptococcic Mastitis Among Dairy Cattle . 70
Ovarian Cyst in a Parrakeet 75
Dirty Butter and Nostrums 75
Vitamins and Distemper 76
Treatment for Perineal Hernia 83
Seventeenth Illinois Veterinary Conference 84
Canine Nutrition 86
Cecostomy in the Dog 96
Improved Test for Chagas' Disease 96
Susceptibility to Encephalomyelitis 97
Biological Diagnosis of Pregnancy 97
Morcos' Pregnancy Test 98
Infectious Paralysis of Cats 98
Effects of Digitalis 98
New Tissue Staining Method 99
Improved Horse-Drawn Ambulance 99
Functions of a Veterinary Corps 99
Human Carriers of Br. Abortus 100
New Method for Staining Smears 100
BOOK REVIEWS:
Dog and Dogs 100
Horseshoes of Interest to Veterinarians 101
The Saint Bernard 101
Veterinary Publicity 101

VOL. XXXII
No. 2

Entered as second-class matter Nov. 8, 1920, at the post office at Chicago, Ill., under the Act of March 3, 1879.

75 E. Wacker Drive
Chicago, U. S. A.

B. A. I. TESTS EVERY SERIAL OF FOWLER SERUM

Animal Tests Prove Potency, Dependability

We are definitely committed to a program of sincere cooperation with the veterinary profession.

24-HOUR SERVICE

● Three large distributors assure you of 24-hour service on Fowler Serum, Pharmaceuticals and Biologics, anywhere in the Corn Belt; Dr. Paul L. Matthews, 4688 Poppleton, Omaha; Dr. Robt. D. Wall, 910 28th Street, Des Moines; and L. L. John, 1018 South Lyndhurst Drive, Indianapolis. Fowler Serum is distributed also by Armour and Company Branch Houses everywhere, thus guaranteeing you prompt service no matter where you may be located.

Write for complete catalogue and price list

● Every serial of Fowler Serum is subjected to the potency test prescribed by the Bureau of Animal Industry. In this test, 8 healthy pigs are inoculated with cholera virus, and 5 of these pigs are simultaneously injected with Fowler Serum. The 5 pigs receiving the serum must live, the other 3 must die, before the serum can be approved.

The B. A. I. test is one of the checks which protect the potency and dependability of Fowler Serum. In addition, U.S. Government Inspectors carefully supervise every step in its production to be sure of the utmost quality and effectiveness. And a sample of each serial of serum is sent to the laboratories of Ashe Lockhart for bacteriological examination.

You can depend upon Fowler Serum at all times. Use it exclusively for uniformly good results. Get a supply to meet your needs from one of the distributors listed at left.

FOWLER SERUM CO.
KANSAS CITY, KANSAS

Distributors of Armour's Quality Dog Food

Fowler Serum Pharmaceuticals and Biologics

Veterinary Medicine

Registered in U. S. Patent Office

VOL. 32 FEBRUARY, 1937 No. 2

Published Monthly by the Veterinary Magazine Corporation
75 East Wacker Drive, Chicago, Ill., U. S. A.
$4.00 a Year; per Copy 50 Cents.

Copyrighted 1936, by Veterinary Magazine Corporation.

All matter appearing in this publication is covered by copyright, and no part of it may be reproduced without specific permission.

Permission will be granted on request for reproduction of anything in the columns of VETERINARY MEDICINE if the purpose of the reproduction is unobjectionable. Where there is any question as to the propriety of reproduction, the wishes of the author will be consulted.

D. M. Campbell, Editor A. T. Kinsley, Associate Editor
H. J. Mostyn, 1265 Broadway, New York, Eastern Representative

The disease most commonly mentioned in the medical literature of the past year was anemia.

A filtrate of the colon bacillus when injected into certain types of cancer in the mouse causes a recession of the tumor and ultimate recovery of the animal.

Blood destruction in disease is not as much of a factor in anemia as failure of blood production.—*Robscheit-Robbins.*

Stomachics and gastric tonics are needed in the treatment of anemia because of the blood-forming function of the stomach.

Prairie dogs infected with plague have been found in Utah, by the United States Public Health Service.

To produce an ounce of female sex hormone would require 500 tons of ovaries from 72,000,000 hogs, says Drs. Klein and Porsche of the Wilson and Armour laboratories.

At the conclusion of his minutes of a meeting held in 1897, the secretary of a state veterinary association wrote: "Thank heaven the subject of tuberculosis did not come up."—*J. C. M. & V. A.*, 18:789.

Many theories have been advanced as to the cause of dental caries but the etiological problem is yet to be solved.

The discovery of prehistoric elephants killed by primitive darts in what is now New Mexico proves to archeologists that this continent was inhabited 8000 years B. C.

The love of dogs by some and the hating of them by others are attitudes as old as man himself. The ancient Hindus and the Israelites despised dogs; the Egyptians venerated them as symbols of divinity.

The first power-alcohol plant for commercial production is now in operation at Atchison, Kansas, producing 10,000 gallons per day. As bias opposition breaks down it is being widely agreed that the blend of alcohol and gasoline makes the ideal motor fuel.

Acetylcholine, the discovery of which brought the Nobel prize in medicine to Dr. Otto Loewi of Austria, is described as the messenger between the nervous and muscular systems. A spurt of it flashes along the nerve trunks with every impulse, voluntary or involuntary. Thus again, the close relation of physiology and chemistry are established.

In the United States more than 300 people die of cancer every day.

A distinguished chemist points out that soybeans are gaining such importance in this country that they constitute one of a big four in agriculture: Corn, wheat, oats and soybeans.

According to statistics compiled by the Chinese Maritime Customs, China, in 1934, exported 75,038 dog skins of a total value of $187,401 and 1,607 dog skin mats and rugs valued at $7,766.

DIAGNOSIS OF BRUCELLOSIS

The agglutination test for undulant fever is not dependable because a negative reaction cannot be "relied on particularly in this disease," says Keller, Pharris and Gaub in the *Journal of the American Medical Association* (Oct. 24, 1936). Blood cultures offer certain difficulties which have not been overcome and the allergic skin test gives no clue as to whether the infection is active or the patient immune.

The authors (*op. cit.*) carried out an investigation to determine the accuracy of tests in patients in the active stage of the disease, in persons exposed by drinking cow's milk, and in patients having other diseases, in all in over 500 persons. In evaluating the three tests (agglutination, skin, opsonin), the authors conclude that the agglutination test is the most dependable in the active stage and in patients who have recovered. In persons who have been infected, the agglutination test may or may not be positive and, therefore, is not reliable in determining the incidence of the disease. Assuming that this investigation is applicable to animals one may well wonder whether the agglutination test in cows is dependable enough to justify condemnations on the evidence it furnishes. Certainly, in view of what one gleans from the passing parade, the advocates of the serological tests cannot blame one for keeping an open mind on Bang's disease control.

According to the 12th and 13th Reports of the Bureau of Animal Industry (1897), swine erysipelas was observed in 1885, 1888 and 1893.

The horse's heart beats about 54,000 times a day or approximately 20,000,000 times a year, and unless stricken with an infection of other organs, it seldom goes wrong.

An injection of 30cc of a 10% solution of sodium chloride into the jugular vein of a large animal acts as an excellent post operative hemostatic. Its mode of action is not clear.

Receipts of livestock by truck at the principal markets of the country during the first nine months of 1936 totaled 17,517,379. This compares with receipts of 15,041,249 head in the like period of 1935.

There is no room for debate on the proposition that a great deal more milk might be used to advantage by the people in Illinois. That malnutrition is no more prevalent than in the past and that Illinois people are better nourished than the inhabitants of many foreign countries are probably true statements but entirely beside the point. Many people in this as well as all other states could be infinitely better nourished and to the advantage of their health than now prevails. Good nutrition is one of the dominant factors in good health. —*Illinois Health Messenger.*

The milk industry ought to be made a public utility and operated on the principles of a public water supply so that every inhabitant could have an adequate amount just as he now enjoys an adequate supply of water. This rather startling suggestion was made by Prof. Julian Huxley as a result of his belief that if every infant, child, woman and man could get milk as easily, cheaply and generously as they can water, and if all were educated to utilize milk commensurate with nutritional needs, the problem of malnutrition due to ill-feeding would be solved.

Preventive medicine, the development of which characterized the nineteenth century so strongly, was enabled through the birth of bacteriology to come into its own. It was the fascination exerted by the theory of spontaneous generation, and the search for the supposed factors, that gave nineteenth century bacteriology its start.

* * * *

Mastitis costs the dairy industry of the United States 20% of its annual income. Economically, it is more important than Bang's disease, more important than tuberculosis ever was.—*Ashe Lockhart.*

Mastitis in the dairy cow can be detected earlier by a proper physical examination than by any other means, but the veterinarian making the examination should always supplement his physical examination by every other test that can be practically applied in the stable. He should neglect no means of acquiring information about the case, but his main reliance must be upon proper physical examination.—*Ashe Lockhart.*

The public is entitled to clean, wholesome milk, produced by healthy cows, and some time I think it is going to insist upon having just such milk. It will require all of the time of all of the veterinarians at present in the United States to supply complete inspection and supervisory service for our total milk supply.—*Ashe Lockhart.*

* * * *

F. W. Fabian (*The Milk Inspector,* July 1936) believes that in the future more emphasis will be placed on the human element in the dairy industry without in any way detracting from our present emphasis on machinery, healthy animals and environmental sanitation. To this end he recommends that all employees in dairies and dairy manufacturing plants be required to pass not only a health examination but also an examination on milk hygiene and that they be required to be licensed. This will result in the employment of a higher type operator and an increased sanitary protection to milk and dairy products.

The intravenous administration of trypanflavine (1:50) to 20 water buffaloes and 104 cows proved successful in the treatment of anaplasmosis in an experiment conducted by M. Van Zwieten.

* * * *

A therapeutic study of Acaprine [a Bayer product] has shown it to be a specific for all forms of piroplasmosis, occurring in Rumania, when administered subcutaneously or intramuscularly and that it is more active than trypan blue or even trypanflavine. That it does not stain the hands of the attendant is considered to be a particular advantage. —*Exp. Sta. Rec.*

* * * *

One of the commonest canine diseases encountered in South Africa is biliary fever caused by *Piroplasma canis,* transmitted by *Rhipicephalus sanguineus* and other ticks. The disease affects almost every dog—usually during its first year of life. This disease has been recognized recently among racing greyhounds in Florida and is probably more widely distributed.

* * * *

Clinical symptoms of vitamin D deficiency—rickets—in calves include: Bowing of the forelegs, either forward or to one side; swelling of the knee and hock joints; straightening of the pasterns; humping of the back; posterior paralysis in case of fractured vertebra; sometimes fractured femurs; often stiffness of gait; irritability; tetany; bloat; anorexia; weakness; inability to stand; cessation of growth, and death.

* * * *

Physicians' names have been given to 375 diseases and 25 diseases bear the name of saints, but only seven diseases have been named for veterinarians—Bang's disease, Johne's disease, Carré's disease, Marek's disease, Salmonellosis, Aujetzsky's disease and Theileriasis. Such names are called *eponyms.* They do honor to the discoverer or to one who has contributed valuable information concerning the disease, but when carried to the extent that has obtained in human medicine, eponymic naming of disease becomes a severe tax on the student's memory and a near abomination.

ANATOMY AND TEACHERS OF ANATOMY

Few anatomists condescend to point out the clinical significance of structures as they trudge along writing their books or teaching their students. But, just why it is a pedagogical sin to do so is not clear. Neither has it ever been clear to student or clinician why it is an infraction for the anatomist to mention function briefly along with the details of position, relation, color and dimension, yet according to the conventionalities, hints on pathology and physiology are taboo in the anatomy course. Says the reviewer of a new book on human anatomy:[1] "We doubt if the student just beginning the study of medicine can appreciate the clinical discussions." Were not this criticism as orthodox among most of the anatomists as it is strange to most students, it might escape notice. We do not believe that the anatomist vulgarizes his science by impressing students with the clinical importance of structures as they pursue their anatomical studies. On the contrary, the opportunity of impressing facts indelibly upon the mind is lost by not taking that advantage within reason, that is, without turning the mind away from the makeup of the structure at hand.

The argument might be illustrated by citing a few examples. There can be no great sin in pointing out that the contiguity of the reticulum, diaphragm and pericardial sac accounts for the high incidence of traumatic pericarditis of the ruminant, that the remarkable intrathoracic relation of the left recurrent nerve of the horse is responsible for roaring, that the exposed position of Steno's duct and the glosso-facial artery are hazards of mandibular surgery, that the corpus luteum inhibits estrum, etc. Many clinical facts can be fixed into the niches of the student's brain without cramming and serve as tentacles for retaining the associated anatomical lore. In fact, the conventional orthodoxy that feigns to withhold clinical matters entirely until the student must be refreshed in the regular course of events two or three years later is questionable. At least, the anatomist overlooks a means to an end that is quite fundamental in teaching—the means of fixing facts permanently upon the mind with the least possible effort.

While it cannot be contended consistently that anatomy should be interpolated with endless distractions in the higher branches of medicine, the fact remains that in avoiding such interpolations at the proper time and place, the job is done too well from every point of view we can conceive. As disease is the only reason for studying medicine, the teacher can certainly do no damage by keeping the mind on that objective as he treks along.

RESEARCH AND PROGRESS

The central motive of nineteenth century medical science was experimental investigation. This key unlocked the doors leading to understanding of and relative control over the functions of life—digestion, assimilation, circulation, respiration, excretion, and cerebrospinal phenomena. The greatest progress, of course, dates from the growth of research laboratories, the first of which began to function about the middle of the century.

RABIES CONTROL

When, in the spring of 1936, reports of the State Department of Health of Illinois showed an epizootic of rabies among dogs was in process of development in the state, two lines of action were adopted. At army posts and CCC camps all owned dogs were vaccinated and strays destroyed—result: no rabies. In civilian communities nothing was done to meet the situation until the epizootic reached considerable proportions —result: 11 deaths of persons from rabies and 4,712 pasteur treatments administered. Rabies among dogs is completely controlled by vaccination; but enforcing the vaccination of dogs is extremely difficult, short of military discipline, and strangely is most strenuously opposed by the class that has the most to gain from it—those commercially interested in the dog industry.

The Brookline (Mass.), Police Department operates a signal call "MSPCA" to contact the ambulance of the Angell Memorial Hospital of the Massachusetts Society for the prevention of cruelty to animals. This enables the ambulance to pick up emergency calls to bring first aid to cats and dogs.—*Our Dumb Animals.*

SALMONELLA INFECTIONS IN CHICKENS

Within recent years considerable interest has been manifested in Salmonelloses in chickens. *S. pullorum, S. gallinarum, S. aertrycke,* and *S. anatum* and possibly other organisms in the Salmonella genus are responsible for Salmonella infections in chickens.

Among the organisms mentioned, *S. pullorum* appears to be the most widely disseminated in this country. Since pullorum disease is recognized as one of the leading poultry diseases in respect to economic losses to the industry, the greater part of the discussion is devoted to *S. pullorum* infection.

ACTINOMYCOSIS YIELDS TO X-RAY TREATMENT

In answer to the question "Has the x-ray proved a valuable aid in the treatment of actinomycosis," the *Journal of the American Medical Association** says: "The treatment of actinomycosis by large doses of x-rays can be considered the most successful treatment."

The recommendation goes on to say that the more localized the actinomycotic foci and the earlier the treatment is begun, the more favorable is the prognosis. The treatment should be applied from more than one field in order to give one the opportunity to repeat the treatment should the first radiation not be satisfactory.

While x-ray treatment is not likely to be employed often in the countless cases of actinomycosis occurring in domestic animals, it is interesting to know of this addition to the therapy of that disease when its use is justified.

*J. A. M. A., Oct. 31, 1936, page 1491.

A new morphine has recently been patented. The improvement over the ordinary morphine is said to consist in that it is less poisonous, that it can be given in smaller doses, and that it acts for a longer time.

Puppies, kept constantly awake, will die after five days, even though eating regularly; but can survive for twenty days without food, if they are allowed to sleep as much as they like.—*Clin. Med. and Surg.*

THE TREATMENT OF TRICHOMONIASIS OF COWS

Douching the vagina with a strong solution of common salt is said to be a strikingly effective treatment for cows affected with *Trichomonas vaginalis.* The treatment is based upon results obtained in the human female.

A sodium chloride solution of 25% in hot water injected copiously at body temperature into the infested vagina for several consecutive days. After several douches no parasites can be found and they do not reappear. The douching causes neither straining nor irritation. From a single treatment in the human female the pruritus is checked; the discharge become scanty and thin; and the pin point granulations disappear.

OVERCROWDED(?)

Forty years ago a book entitled "The Physician as a Business Man," by J. J. Taylor, M.D., issued the warning that "Our [medical] profession is overcrowded." Last year 7,000 freshmen were admitted to the medical schools and the average gross income of American physicians of all classes in 1935 was estimated at $5,874.00. The figure of earnings are taken from *Medical Economics,* for June, 1936.

A profession is never overcrowded until all of the work its trained members are intended to do falls into their hands in the natural course of events. In 1936 we still hear echoes of a crowded veterinary profession although whole counties and groups of counties are carrying on without a legally qualified veterinarian. No profession is as inadequate in numbers as ours.

SALMONELLA INFECTIONS IN POULTRY

In combating pullorum disease, methods of control and eradication appear to be the remaining important problems. Recent researches have emphasized that *S. pullorum* possesses potentialities for atypical characters which may exert an influence on the progress of controlling or eradicating the disease from a flock. Strains of *S. pullorum,* which exhibit a tendency to vary in their behavior, should not be employed in antigens used for the macroscopic agglutination test.

Much effort has been exerted in the control of the disease through such means as fumigation of incubators, rigid culling, medication of drinking water, and modifying brooder management. All of these measures may tend to reduce mortality, but they do not eliminate completely all losses from the disease. This fact has long been appreciated in certain sections where eradication of the disease from flocks has been adopted as the goal.

Pullorum disease can be eliminated from flocks by means of the macroscopic agglutination test when supplemented by effective eradication measures such as testing all the birds on the premises until non-reacting, preventing the introduction of infection through custom hatching, the return of show or contest birds to the flock, the purchase of infected stock or any other faulty management that may introduce infection.

Through accumulated testing results poultrymen in Massachusetts and other states have come to realize the value of pullorum disease eradication. A ten-year testing summary of Massachusetts flocks reveals that the average percentage of positive tests decreased from 4.03% to 0.3%. In 1927, 45.78% of the total tested flocks were non-reacting, while in 1936 the percentage had mounted to 91.27%. Comparative data of flocks tested for the first time and flocks tested for three or more consecutive years show that the percentages of positive tests for an eight-year period were markedly less for the flocks tested for three or more consecutive years. Also the percentages of non-reacting flocks are greater in the three-year group. The disease can be eradicated from flocks within one season by short-interval testing. Data concerning short-interval testing in ten infected flocks show that in one flock no reactors were detected after the first test; in six flocks no reactors were detected after the second test, and in three flocks no infection was found after the third test. All flocks tested the following year were found non-reacting.

The doubtful reacting bird, when detected in a previously non-reacting flock, is a baffling problem to the diagnostician or control official who interprets the results of the test. Such reactors yield *S. pullorum* on bacteriological examination in a small percentage of cases. However, in routine testing the detection of only doubtful reacting birds in a previously non-reacting flock is not sufficient evidence to condemn the flock as infected. Necropsies of such birds suggest that when no conclusive evidence of pullorum infection can be established it appears safe to credit the flock with a negative test. Doubtful reactors may be due to causes other than pullorum disease. Therefore, testing and control agents should give such flocks special consideration before they are removed from the non-reacting lists.

Salmonella diseases, such as fowl typhoid and paratyphoid infections, when present in a flock may offer a complicating problem in pullorum disease. Sera of birds infected with typhoid or paratyphoid organisms may react when tested with pullorum antigen. Hence a fowl typhoid or paratyphoid infected flock may be condemned as pullorum-disease infected by testing agencies that resort only to the macroscopic agglutination test. Necropsy service and bacteriological examination are essential in order to establish a correct diagnosis of Salmonella infections in poultry flocks.

In areas where commercial hatcheries

* By H. Van Roekel and K. L. Bullis, Amherst, Mass., Department of Veterinary Science, Massachusetts Agricultural Experiment Station. Abstract of a paper presented at the 74th Annual Meeting of the A.V.M.A., Columbus, O., August 11-14, 1936.

handle the bulk of hatching eggs and chicks the adoption of a sound eradication program seems plausible. Hatcherymen must recognize that Salmonella diseases are infectious in character and must be treated accordingly. Eggs from flocks revealing no infection should not be incubated in the same premises where eggs from infected or untested birds are incubated. Likewise, pullorum clean chicks should not be reared with chicks from untested or infected flocks. In certain localities commercial hatcheries have established facilities which permit the hatching of eggs from pullorum clean custom flocks in incubators located on premises far remote from the main commercial incubator. Through such a means the commercial hatchery is in a position to maintain as well as to establish additional pullorum clean custom flocks. It is hoped that the widespread interest and participation in pullorum disease testing will lead to a sound eradication program national in scope.

SELENIUM POISONING IN ANIMALS*

For many years there has been known to the farmers of the Great Plains of the North Central region of the United States a chronic disease in livestock commonly and erroneously referred to as "alkali" disease. The first scientific report of it appears to have been written in 1856 by Dr. T. C. Madison,[1] who as an Army surgeon while stationed at Fort Randall, now part of Gregory County, S. Dak., observed this condition in many cavalry horses. Madison also correctly suggested a toxic factor in the local forage as a probable cause of the disease. His suggestion seems to have been forgotten, however, for until relatively recent times the disease has been commonly associated with high-mineral content in the drinking water generally prevalent in those localities where the disease has been known to occur, hence the term "alkali" disease.

*The Selenium Problem in Relation to Public Health, a Preliminary Survey to Determine the Possibility of Selenium Intoxication in the Rural Population Living on Seleniferous Soil. By Maurice I. Smith, Principal Pharmacologist, K. W. Franke, Consultant, and B. B. Westfall, Assistant Chemist, United States Public Health Service, U. S. *Public Health Reports*, Oct. 30, 1936.

The chief characteristics of this disease as it manifests itself in horses, cattle, and hogs are loss of hair, especially from the mane and tail of horses, loss of weight and emaciation, and varying degrees of involvement of the hoofs. Excellent descriptions of the gross and microscopic pathology may be found in papers by Franke,[2] Draize and Beath.[3]

The true nature of so-called "alkali" disease did not become generally known until Franke[4] demonstrated the toxic character of some of the grains grown in sections of South Dakota where the disease in livestock has been more or less prevalent. Following this, Robinson[5] was able to demonstrate the presence of selenium in the grain which had been previously found to be toxic to animals. The work of Hurd-Karrer[6] furthermore demonstrated the ability of plants to assimilate selenium from the soil, and a survey by Byers[7] showed the wide though spotty distribution of selenium in the shale soils and in the grain and vegetation grown in several of the States of the North Central Great Plains.

This succession of events has thus led not only to a better understanding of the etiology of the so-called "alkali" disease in livestock, but it has also served to focus attention upon the possibility that the public health might be involved, since selenium-bearing grain and vegetation grown upon seleniferous soil may also enter into the human dietary.

REFERENCES

1. Madison, T. C. 36th Cong., 1st sess. Senate Ex. Doc., No. 52, pp. 37-41 (1860). Cited by Franke et al. (2).

2. Franke, K. W., Rice, T. D., Johnson, A. G., and Schoening, H. W. U. S. Dept. Agric. Circular No. 320 (1934).

3. Draize, H. J., and Beath, O. A. J. Am. Vet. Med. Assoc., 86: 753 (1935).

4. Franke, K. W. J. Nutr., 8: 597 (1934).

5. Robinson, O. W. J. Assoc. Off. Agr. Chem., 16: 423 (1933).

6. Hurd-Karrer, A. M. J. Agric. Res., 50: 413 (1935).

7. Byers, H. G. U. S. Dept. Agric. Tech. Bull. No. 482 (1935).

Passing the Stomach Tube

Questions by Dr. J. R. Stewart, Rushcutters Bay, Sydney, Australia
Answers by Dr. G. Lichtenstern, Rotthalmunster, Germany

Restraint

Question: What restraint do you use (a) for foals six months old; (b) for yearlings; and (c) for horses?

Answer: In the horse breeding section of Rotthalmünster, the horses are farm-raised, and therefore gentle; moreover, the horses presented for treatment are as a rule, in advanced stages of sickness, and consequently, no restraint is needed for the passing of the stomach tube.

Question: Do you use a crush?

Answer: If the horse should prove to be uncontrollable, or if the attendants are too feeble to manage the horse, then the horse is put into a chute or squeeze.

Question: How do you prevent the animal from (a) rearing; (b) striking; and (c) throwing himself?

Answer: Horses suffering from illness do not rear, strike or throw themselves when handled; if the horse is unruly, one may put hobbles on the front legs.

Question: Do you use a twitch?

Answer: When the horse is very unruly, a twitch is used.

Question: Do you tie the front legs down tightly to the ground?

Answer: Ordinarily, the raising of one leg is sufficient to restrain the horse. However, if necessary, a stock may be used for restraint.

The Stomach Tube

Q. Do you pass the stomach tube through (a) the nose; (b) the mouth, and if so, do you use a gag?

A. We pass the stomach tube through the nose exclusively.

Q. Describe the length of the tube, its external and internal diameter.

A. Our stomach tube is about four meters in length. The external diameter is about one and one-eighth inches; the internal diameter is about five-eighths of an inch. Thus, the thickness of the wall of the tube is about one-fourth inch.

Q. How long will it take a quart of mixed oils, such as paraffin, castor or linseed, to run down the tube into the stomach?

A. With the tube just described, one-half minute is required. If greater speed is wanted, a syringe may be used.

Q. Is the composition of the tube rubber, or rubber reinforced with canvas, like a garden hose?

A. The stomach tube we use is distributed by the firm H. Hauptner, Berlin, Germany. The tube is of rubber made by a special process. It contains no canvas.

Q. Describe the degree of stiffness and flexibility.

A. The flexibility of the tube may be compared to that possessed by a willow. The tube should be neither too hard nor too soft.

Q. What is the nature of the end inserted? Is it just rounded smooth, or has it an enlarged end like a bulb or olive?

A. The end inserted is rounded smooth.

Q. Do you use a funnel, and if so, do you pass the tube first, or is the funnel fixed in the tube before you start?

A. The outer end of the tube is connected with a vessel having a capacity of five quarts.

Q. Do you pass the tube right down into the stomach, and if so, how do you know when it is in the stomach?

A. We do not pass the tube into the stomach.

Q. What measurements or computations do you use before you start on a horse of a given size to determine how far you are to pass the tube to be sure it has traveled far enough to be sure it has entered the stomach?

A. No measurements or computations are necessary because the passing of the tube can be observed from the outside.

Q. How far down the esophagus do you pass the tube?

A. The tube is passed just a trifle beyond the aperture of the chest.

Q. What measures do you adopt to prevent the tube being pulled out of the esophagus should the horse suddenly throw his head up, down or sideways?

A. An attendant keeps the tube in position by pressing the tube and nasal ala between thumb and fingers.

Q. What length of the tube is free outside the body?

A. This varies with the length of the neck and the length of the tube.

Method of Inserting the Tube

Q. Where do you stand in relation to the horse?

A. The operator should stand always on the same side on which the tube is inserted through the nose.

Q. What method do you adopt to aid or ensure the horse swallowing the tube?

A. The head of the horse must be bent downward slightly. The tube must be lubricated. The stomach tube is inserted with the concave side of the coil as the underside; when the tip of the tube has about reached the larynx, the tube is then rotated 180°, so that the concave side of the coil is now the upper side. This will prevent the tube from entering the larynx and will aid it in gliding into the pharynx and down the esophagus.

Q. How do you determine that the tube is in the esophagus and not in the trachea; that is, what are the signs that it is in the esophagus?

A. The tube can be seen in the jugular groove, gliding down the esophagus. When in the esophagus, the tube does not glide easily but offers a certain resistance. The contact of the tube with the esophageal wall causes a spasm which lasts from one to three minutes, before the muscles of the wall relax again, at the termination of which the tube has to be pushed down further at once. When the tube is in the esophagus, it is difficult to blow air into the tube. On putting the ear to the tube, if one hears regurgitating sounds, this is a sign that the tube is in the esophagus.

Q. Is the tube easier to insert into the esophagus or into the trachea?

A. When the tube enters the trachea it glides down very easily, but the course cannot be observed from the outside. Cough is a symptom indicating that the tube is in the trachea.

Q. If the tube at times enters the trachea, what procedure do you adopt to overcome this difficulty and prevent a repetition of this happening?

A. The tube is to be pulled back and care is taken that the head of the horse is kept slightly bent upon the neck and that the concave side in the coil of the tube is directed upward.

Q. Does the tube ever bend round behind the soft palate and enter the mouth and so fail to enter the esophagus at all? If so, how do you recognize this happening and what precaution do you adopt to prevent this occurring?

A. When the tube bends over and enters the mouth, it will not become visible in the jugular groove, and it cannot be pushed further down. This occurrence may be prevented by using a more flexible tube, or by changing to the other nostril. Expedient use of the bending of the tube may be made in cases where it is desirable to dislodge a foreign body (carrot, apple, etc.) which has become lodged behind the vellum.

Treatment of Parasites in Horses by Means of the Stomach Tube

Questions by Dr. J. R. Stewart, Rushcutters Bay, Sydney, Australia

Answers compiled from U. S. Department of Agriculture Bulletins

Assuming you have now passed the tube to the prescribed position as mentioned before and have adopted the precaution described to insure that the tube is correctly placed, describe the actual operation of dosing for bots.

Question: What medicament do you use to eliminate bot larvae?

Answer: Carbon disulphide.

Q. Give dosage for (a) a foal six months old, thoroughbred; (b) a foal 12 months old, thoroughbred; (c) a two-year-old, thoroughbred, and (d) a horse four years of age or upward, thoroughbred.

A. The dosage of the medicament is 6 cc. for each 250 pounds of body weight (six drams for a horse weighing 1,000 pounds). Animals should be fasted for 18 hours before treatment.

Q. Do you give the medicament (a) alone; (b) diluted with any liquid, and if so, what liquid?

A. Alone, undiluted.

Q. Do you give any liquid immediately before or after the medicament and if so, describe in detail and state quantities.

A. The horse should be fasted for 18 hours before treatment. The use of oils or purgatives in combination with, or following, the treatment is likely to be detrimental.

Q. After dosing one horse do you wash, disinfect or sterilize the tube before inserting into the next horse, and if so, describe procedure.

A. The tube is cleaned and rinsed in cold water, except when used in a horse with an infectious disease. In the latter case, the tube is sterilized in live steam.

Q. What medicament do you use for the removal of worms?

A. Carbon disulphide against *Ascaris equorum,* oil of turpentine against tapeworms, oil of chenopodium against strongylus species and against *Oxyuris equi,* carbon tetrachloride against *Habronema.*

Q. Give prescription and dosage for (a) a foal six months of age, thoroughbred; (b) a foal 12 months of age, thoroughbred; (c) two-year-old thoroughbred; and (d) a horse four years and upward, thoroughbred.

A. Carbon disulphide is given in a dose of 6 cc for each 250 pounds of body weight. Oil of turpentine is given in a dose of 60 cc (in capsules), followed every second day by 30 cc until five or six doses have been given. Oil of chenopodium is given in a dose of 4 cc for each 250 pounds of body weight.

Q. Do you give any liquid just prior to or immediately following the worm prescription?

A. With the carbon disulphide treatment the animal should be fasted for 18 hours before treatment. Purgatives should not be given. In the case of oil of turpentine treatment, the last dose (of 30 cc) is immediately preceded or followed by one liter of raw linseed oil. In the case of oil of chenopodium treatment, the animal should be fasted for 36 hours before treatment. One liter of linseed oil is given immediately preceding or following the anthelmintic. Raw linseed oil may produce excessive purgation and a substitute of castor oil and neutral oil may be used as follows:

Weanlings: Castor oil, four to six ounces; neutral oil, one pint.

Yearlings and two-year-olds: castor oil, six to eight ounces; neutral oil, one pint.

Three-year-olds and older: castor oil, eight to 10 ounces; neutral oil, one-and-one-half pints.

Q. If whilst in the middle of the actual dosing the horse perchance performed some unaccountable gyration, such as throwing himself (a) what do you do; (b) what happens to the medicament?

A. The stomach tube must be pulled out at once. Any medicament in the tube may be retained there by placing the thumb over the aperature in the free end.

Q. As regards feeding, do you adopt mashing and if so, how many?

A. The feeding of mashes is not required.

Q. Do you employ starvation and if so, how long?

A. In the case of carbon disulphide, carbon tetrachloride and oil of chenopodium treatment, fasting for 18 to 36 hours, as stated, is required.

Q. What after care is required? What do you do immediately after treatment? Do you keep the animal away from food for several hours, and if so, for how long?

A. Water as well as feed should be withheld for five to six hours after treatment.

Q. Do you give water or feed first, i.e., do you allow a drink before feeding or do you insist upon feeding before watering?

A. It is preferable to offer water first.

Q. Describe subsequent feeding.

A. The individuality of the case must be taken into consideration.

Q. Does the bot medicament cause purging? Answer: No.

Q. Does the worm treatment cause purging, and if so, of what duration and how long before it starts?

A. Carbon disulphide does not cause purgation; the ascarids usually come away on the second and third day; but may continue to be expelled for several days. Carbon tetrachloride causes purgation.

Q. How long before the bots or worms begin to appear in the manure?

A. The bots will be found in the feces in maximum numbers on the third day and continue to pass for 17 days or even longer. Ascarids usually come away on the second and third day, but may continue to do so for several days.

Q. Advise the risk of (a) death; (b) illness as a result of the medication. Describe methods adopted to (a) prevent; (b) overcome such happenings.

A. The risks are as follows: Carbon disulphide is a volatile, inflammable liquid and should be kept away from fires or open flames. Oil of chenopodium is dangerous for pregnant mares; it is contraindicated in febrile conditions and in weak or debilitated animals. Carbon tetrachloride should be substituted.

Q. What degree of efficiency does the method and treatment obtain?

A. The degree of efficiency of the above named drugs varies between 90% and 100%.

Q. At what intervals must medication be repeated to insure removal of all the bots and the great proportion of worms?

A. This depends on the efficiency obtained with the drug, and on the constitution of the horse, and the time at which treatment is given. Thirty days should intervene. No fast rule can be laid down.

Q. How often should worm or bot treatment be repeated?

A. It is customary to treat horses twice a year for the removal of ascarids and strongyles. One treatment for bots in late January or in February is sufficient. If given in December, it should be repeated in February or early March [Dates changed to conform to season in the Northern Hemisphere].

The Russo-Japanese War (1904-5) was the first war in which disease did not kill more men than battle wounds.

* * * *

Funds have been appropriated for a new veterinary science building, to be used for teaching and research, at the Mississippi State College.

* * * *

The foundation of modern clinical medicine was laid by Laënnec (1781-1826), through his introduction of the stethoscope, reinforced by Corvisart's re-introduction of Auenbrugger's art of percussion.

* * * *

The particles of the dyes employed in medicine are about one seven millionth of an inch in diameter. They pass through the capillary filter without chemical or physical change and lodge in pathological tissues.

* * * *

This matter of maintaining the proper balance between the sympathetic and parasympathetic systems is of major importance, for it has been shown that they oppose one another in the control of many functions, and an interference with the operation of either by reason of a deficiency of calcium on one hand and organic potassium on the other can bring about such conditions as, for example, gastric ulcers, for which the cutting of the left branch of the vagus has been found a surgical remedy.

* * * *

Herbs and animal extracts employed in Chinese medicine three centuries before this era are still used and highly appraised in the U. S. Pharmacopeia. An extract made from boiled toads having about the same action as digitalis was employed for dropsies and heart affections and ground dragon bones was the calcium therapy used for convulsions. The Chinese practiced inoculation for the prevention of smallpox at least five centuries before Jenner.

The Incidence of Streptococcic Mastitis Among Dairy Cattle

By C. S. BRYAN, East Lansing, Michigan
Michigan Agricultural Experiment Station

THE value of a dairy cow is greatly influenced by the condition of her udder. The mammary tissue, which is highly specialized, is susceptible to abnormal conditions and infections by virtue of its location and activity. Any intermittent or permanent alteration of the udder or its activity is not conducive to profitable milk production; Show and Beam [10] reported that mastitis reduced milk production 22% and butterfat production 24%. Approaching the problem from a yield per lactation basis Minett and Martin [7] reported the reduction of milk yield due to mastitis as being 954 pounds per lactation period. These figures present the loss in milk and butterfat production of mastitis affected cows and raise an inquiry concerning the prevalence of the disease among dairy cattle.

The methods thus far presented for the diagnosis of mastitis fall into three main groups, (1) Direct methods—the miscroscopic examination of properly collected and handled milk samples of the cultural examination for the etiological agent, (2) Indirect methods—these measure the abnormality in milk due to interference in function of the udder by the infecting streptococci, and (3) Physical examination of the udder—this determines the presence or absence of indurated or scar tissue that forms as a result of injuries caused by streptococci or other factors.

If a program of prevention and control of streptococcic mastitis is to be carried out, it is necessary that the diagnostic test determine the presence or absence of the etiological agent. This, together with the fact that indirect tests give variable results from time to time, was the reason for the use of the microscopic test [2] in this survey. In this test the milk is the medium for the streptococci and if streptococci are present even in small numbers, they will reproduce sufficiently to be seen on microscopic examination of the milk. The variability of results of the indirect tests and the adoption of cultural media that do not always support growth of the streptococci have given rise to confusing estimations concerning the incidence of streptococcic mastitis among dairy cattle.

DURING the past several years, attempts have been made by investigators to determine the number of cows that react to the various tests that have been presented as being of value in the diagnosis of streptococcic mastitis. In 1930, Grenz [4] reported that of 623 cows studied 37.8% were infected with streptococci; in another group of 476 cows he found 38% infected. Brooks [1] in 1932, wrote, "It is not unusual to find 10% of cows in herds with some degree of involvement. A member of our staff found about 50% of the cows in one county affected, and occasionally entire herds are involved." No mention was made of the methods used in diagnosis of mastitis. Hucker [5] et. al. in 1932, and Edwards [3] in 1934, employed indirect tests as well as cultural examination for determining the presence of streptococcic mastitis and reported that 78% and 26.4% respectively, of all cows examined were infected. Kästli [6] prefers cultural methods because indirect tests do not detect more than one-half of the infected cows and frequently yield conflicting results. Of 135 cows in seven herds examined in 1933 he found 84 or 62.2% infected. Rosell [9] in 1934, using indirect tests and supplementing these by laboratory examination of all negative and doubtful samples of milk, reported that the incidence may approach 80% of infection with an average of 30% of the herds infected. Sjolund [11] in 1934 presented the view that cultural examination of milk sam-

*Journal article No. 272 (New Series) Michigan Agricultural Experiment Station.

ples is most important; this not only entails isolating the streptococcus present, but also identifying it as being *Streptococcus agalactiae* or some other species. As a result of studies, he found 1.3 to 5.9% of herds examined infected with *Streptococcus agalactiae* and 16.2% of the cows in infected herds excreting the streptococcus. On the basis of physical examination of the udder, a mimeograph release from Wisconsin [12] in 1936, reported that upon examination of 505 herds 91.8% of the herds and 12.4% of the cattle examined had mastitis.

These data indicate the lack of uniformity in methods of mastitis diagnosis employed by the various workers. In summarizing these figures from 10 to 100% of all cows examined by various investigators have been designated as having mastitis and 1.3 to 91.8% of all herds were involved. Certainly very little definite information can be gathered from these conflicting reports. It is evident that a systematic survey, employing an accurate and standard method for diagnosing streptococcic mastitis, is necessary to determine the incidence of the disease among dairy cattle. The following study was undertaken with this aim in mind.

Methods

A typical milk shed consisting of approximately 1000 producers was selected in which to make the survey. Herds in all sections of the milk shed were tested. Therefore, no discrimination was used in deciding upon the herds to be tested. In all, 2715 cows in 322 herds were tested. Due to the extent of the problem, the survey was extended over a period of two years.

The microscopic test [2] (the microscopic examination of properly collected cow composite milk samples that had been incubated for at least 12 hours) was used in diagnosing streptococcic mastitis. If the milk samples are collected by wiping the udder of the cow and discarding a stream of fore milk from each quarter prior to milking a small amount of milk directly into the sterile tube, the presence of streptococci plus leucocytes in excess of 1,000,000 per cubic centimeter of milk indicates streptococcic mastitis. The absence of both streptococci and leucocytes indicates freedom from streptococcic mastitis, and leucocytes in excess of 1,000,000 per cubic centimeter without streptococci constitute a suspicious reaction. Some of the cows eliminating streptococci in the milk may not immediately react to the indirect tests that are based upon alteration in the composition of the milk, but upon repeated examination abnormal milk will be produced and scar or indurated udder tissue can be detected in the udder by physical examination. Injuries resulting from factors other than infection may result in the formation of scar tissue in the udder and therefore complicate the diagnosis of mastitis on the basis of physical examaition alone. Cows with indurated udders should, however, be eliminated from the herd because they will not produce milk at a profit. A physical examination was made of the udder of each cow tested.

Results and Discussions

This survey was undertaken in an effort to determine the incidence of streptococcic mastitis among dairy cattle in Michigan. There is no reason to suspect that these results could not be duplicated in any other dairy district at the present time. A total of 2715 cows in 322 herds were tested. The size of herds varied from two to 41 milking cows each.

TABLE 1.—NUMBER OF HERDS WITH STREPTOCOCCIC MASTITIS ACCORDING TO THE PERCENTAGE OF INFECTION PRESENT IN THE HERD

Number of herds	Percentage of infection	Range of number of cows in herds	Total number of cows tested	Total number of cows infected
4	100	2-24	37	37
4	80-99	7-17	42	35
15	60-79	3-25	142	87
49	40-59	2-34	398	196
110	20-39	3-20	832	226
95	1-19	6-41	1026	131
45	0	2-15	238	0
322	.....	.....	2715	712

In Table 1, the herds are classified according to the percentage of infection in the herd and the number of herds with that percentage of infection; in addition the range of number of cows in herds and the

total number of cows and the number of infected cows in herds of each percentage of infection are presented.

The largest group of herds (110) had from 20 to 39% of infection, while the largest groups of cows (1026) were in the herds that had from one to 19% of infection. The largest groups of infected cows (226) were in herds with from 20 to 39% of infection and the next largest group (196) in the herds with from 40 to 59% of infection. Of the 2715 cows tested, 712 or 26.2% were infected with streptococcic mastitis. Both large and small herds are present in each group, classified according to the percentage of infection present. Thus there was 100% infection in four herds, varying in size from two to 24 cows, and containing an aggregate of 37; 80 to 99% infection in four herds; varying in size from seven to 17 cows and containing an aggregate of 42; 60 to 79% infection in 15 herds, varying in size from three to 25 cows, and containing an aggregate of 142; 40 to 59% infection in 49 herds, varying in size from two to 34 cows and containing an aggregate of 398; 20 to 39% infection in 110 herds, varying in size from three to 20 cows, and containing an aggregate of 832; 1% to 19% infection in 95 herds, varying in size from six to 41 cows and containing an aggregate of 1026. Forty-five herds, varying in size from two to 15 cows, aggregating 238 animals, contained no streptococcic mastitis infection.

Streptococcic mastitis therefore is as prevalent in small herds as it is in large herds. The exact number of cows and the number of cows with streptococcic mastitis are presented. It is evident that streptococcic mastitis is no respector of the size of herd for high and low incidences of infection are found in herds of all sizes.

A summary of the total number of cows tested, percentage of streptococcic mastitis infection among the cows tested, and the physical examination of the udders is presented in Table 2. Of the 322 herds tested 45 or 14% did not have any streptococcic mastitis present while 277 or 86% of the herds had the infection present. A total of 2715 cows in 322 herds were tested and 712 or 26.2% were infected with streptococcic mastitis. The herds with no mastitis are in the minority at the present time. In some cases only one or several infected cows were in the herd; the elimination of such cows by slaughter will establish more herds free of streptococcic mastitis at comparatively little cost.

A physical examiation was made of the udder of each cow tested. Since the herds were visited throughout the day the examination was not always made of the empty udders. The writer realizes the limitations of this procedure and presents the data of Table 2 with the knowledge that most likely under ideal conditions more than 610 indurated udders would have been detected. Four hundred and ninety-one of the 610 indurated udders were classified as infected by the microscopic test with 10 additional as suspicious, (leucocytes in excess of 1,000,000 per cc. but no streptococci being found in the milk). Disagreement in results were obtained in only 109 cases; these udders had indurated tissue but were classified as not-infected by the microscopic test. A possible explanation of this disagreement may be that the scar or indurated udder tissue had formed as a result of other factors than infection by streptococci. Plastridge and Anderson [8] reported data showing that the microscopic test is efficient in detecting 99% of the cases of streptococcic mastitis. In addition they found some false positives (cows eliminating streptococci but giving no other indication of mastitis). During subsequent observation, some of these false positives gave positive results to the indirect tests and therefore are classed by the above workers as having mastitis. No doubt upon further study, all of the so-called false positive reacting cows will give evidence of mastitis infection and therefore should be classed as infected upon finding the etiological agent in the milk. This is very important if a program of prevention and control of streptococcic mastitis is to be carried out successfully.

The high incidence of this infection among dairy cattle presents a real problem to the dairymen. The streptococcus infected

TABLE 2.—SUMMARY OF THE TOTAL NUMBER OF COWS TESTED, PERCENTAGE OF STREPTOCOCCIC MASTITIS INFECTION AMONG COWS TESTED, AND THE PHYSICAL EXAMINATION OF THE UDDERS

	Total Tested	Total not Infected	Total Infected	Percentage of infection	Total udders Indurated	Classification of indurated udders by microscopic test: Infected	Suspicious	Not infected
Herds	322	45	277	86				
Cows	2715	2003	712	26.2	610	491	10	109

TABLE 3.—COWS WITH STREPTOCOCCIC MASTITIS CLASSIFIED ACCORDING TO AGE AND SIZE OF HERD

Number of Herds	Size of Herds	Age of Infected Cows: 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
23	1- 4	3	2	3	9	2	8	6	1	1	2	0	0	0	0	0
58	5- 9	8	22	23	24	19	20	11	9	9	3	2	1	0	0	1
61	10-14	29	31	37	39	29	25	17	6	7	6	6	0	1	0	0
28	15-19	25	14	20	27	31	27	13	13	8	6	2	0	0	0	0
15	20-24	21	18	11	19	20	13	10	7	0	2	0	0	1	0	0
1	25-29	1	4	1	1	0	0	1	0	0	0	0	0	0	0	0
4	30-34	6	6	3	2	5	3	4	2	0	1	0	0	0	0	0
2	35-39	1	2	3	3	7	3	1	0	1	0	1	0	0	0	0
1	88	12	10	12	9	8	8	3	0	0	0	0	0	1	0	0
193	855 cows tabulated	106	109	113	133	121	107	66	38	26	20	11	1	3	0	1
Percentage of infected cows in age groups		12.2	12.8	13.4	15.5	14.3	12.4	7.7	4.4	3.0	2.3	1.4	0.1	0.4	0.0	0.1

TABLE 4.—PERCENTAGE OF STREPTOCOCCUS INFECTED COWS IN DIFFERENT AGE GROUPS AS COMPARED TO THE TOTAL NUMBER OF COWS IN THE DIFFERENT AGE GROUPS IN APPROXIMATELY 611 HERDS

	Age of Cows: 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	T'tal
Number of infected cows	106	109	113	133	121	107	66	38	26	20	11	1	3	0	1	0	855
Percent of infected cows	12.2	12.8	13.4	15.5	14.3	12.4	7.7	4.4	3.0	2.3	1.4	0.1	0.4	0.0	0.1	0.0	.....
*Cows in 611 Herds	1016	1287	1051	827	607	456	321	210	138	81	63	28	14	11	2	3	6115
*Percent of cows	16.6	21.3	17.2	13.5	9.9	7.4	5.2	3.4	2.2	1.3	1.04	.46	.23	.18	.04	.05	.....

cows must be adequately segregated from the non-infected cows or better still—eliminated to prevent further spread of the infection within the herd.

The age of the infected cow may determine the disposition to be made of such an animal. Although 322 herds were tested, it was possible to obtain data relative to the age of individual cows in only 193 herds; these included a total of 855 infected cows. These figures together with the size of herds and number of herds of each size are summarized in Table 3. The largest number of infected cows (689 of the total 855) were two to eight years of age, with the highest percentage of cows (15.5) being five years old. The age distribution of infected cows does not bear any relationship to the size of herd. Either small or large herds may have a few or a large number of streptococcus infected cows present.

The fact that many young cows are infected presents an inquiry relative to the fate of these cows, especially since only a small percentage of the total number of infected cows was over eight years of age. A. C. Baltzer, of Dairy Department, kindly furnished some figures on the number of cows in 611 herds and the percentage of these 6115 cows of the various ages. These

*These figures from unpublished data furnished by Prof. Baltzer of the Dairy Husbandry Department of Michigan State College.

herds are in Dairy Herd Improvement Associations and were not otherwise included in this study. It is evident from the data in Table 4, that the largest number (5255 of the 6115) and percentage of cows (85.9) are from two to seven years of age.

In 611 herds, cooperating in dairy herd improvement work, 14.10% of the cows were of age eight or over and 19.4% of all infected cows studied were eight or more years of age. Evidently most cows that are non-profitable because of mastitis are eliminated from the herds before reaching the age of seven years, and the cows of eight or more years of age that remain in the herd are infected with streptococcic mastitis.

Summary

In a survey covering 322 herds of a typical milk shed, 86% of all herds had streptococcic mastitis and 26.2% of all milking cows tested were infected with streptococci of mastitis.

The incidence of infection was not influenced by the size of the herd for some large and some small herds were found to have a high percentage of cows infected and others had a low incidence of infection.

Most cows that are non-profitable because of mastitis are eliminated from the herds prior to reaching the age of six or seven years, but the majority of cows of eight years of age or older that remain in the herd are infected with streptococcic mastitis.

Zusammenfassung

Die Untersuchung von Milchproben aus einem vorbildlichen Molkereidistrikt ergab dass in 86% aller Herden Galtfälle vorkamen, und dass 26.2% aller Milchkühe mit Galt behaftet waren. Die Häufigkeit der Erkrankung war in keiner Weise von der Anzahl der Kühe in einer Herde abhängig.

Resumé

L' inspection d' une region laitière typique démontrait que 86% des troupeaux exhibaient de mammite streptococcique, et que 26.2% des vaches examinées exhibaient mammite streptococcique. L' incident des mammites ne depends pas du nombre des vaches dans la troupeau.

* * * *

Literature Cited

1. Brooks, Paul B. The Relation of Bovine Mastitis to Human Infection. Jour. Prev. Med. 6 No. 2, p. 111. 1932.

2. Bryan, C. S. The Microscopic Diagnosis of Infectious Mastitis. Vet. Med. 30 No. 10, p. 149. 1935.

3. Edwards, S. J. Value of Field and Laboratory Tests for the Diagnosis of Chronic Streptococcic Mastitis. Jour. Comp. Path. and Therap. 47 p. 49. 1934.

4. Grenz, Albrecht. The Practical Meaning of Streptococci Infections of the Udder. Milch. Forsch 11, No. 3. 1930. Abstracts of Literature, Int. Ass'n Ice Cream Manufacturers 4, p. 26. 1930-31.

5. Hucker, G. J. et al. Mastitis: I. The Incidence and Detection of Sub-Clinical Streptococcus Mastitis. N. Y. Agr. Exp. Sta. Tech. Bul 199. 1932.

6. Katli, P. Systematic Mastitis Control Around Bern, Schweiz. Arch. Tierhlk. 75 p. 461; (Abstract) Vet. Bul. 4, No. 6, p. 406. 1933.

7. Minett, F. C., and W. J. Martin. Influence of Mastitis and of Brucella Abortus Infection Upon the Milk Yield of Cows. Jour. Dairy Research 7, No. 2, p. 122. 1936.

8. Plastridge, W. N., and E. O. Anderson. Detection of Shedders of Streptococci Responsible for Infectious Bovine Mastitis. Amer. Jour. Pub. Health 26, No. 7, p. 711. 1936.

9. Rosell, J. M. Conclusions Drawn from Eight Years' Study of Mastitis in Europe and North America. Le Lait 14, p. 914 and 1050. 1934.

10. Shaw, A. O., and A. L. Beam. The Effect of Mastitis Upon Milk Production. Jour. Dairy Sci. 18, p. 353. 1935.

11. Sjolund, J. Udder Bacteria and Milk Control. Nord. Vet.-Motet Helsingfors, p. 172. 1933; (Abstract) Vet. Bul. 5, No. 3, p. 151. 1934.

12. Wisconsin Dept. of Agriculture and Markets and U. S. Bureau of Animal Industry Mimeograph Release. 1936.

OVARIAN CYST IN A PARRAKEET*

The subject was a five-months-old, female parrakeet. The bird when brought to the laboratory was reported to be attempting to lay an egg. There was a great swelling on the abdomen and it was decided to attempt an operation. Before this could be done, however, the bird died. An autopsy showed a cystic tumor of ovarian origin.

The weight of the tumor was 10 grams. It was 37 millimeters long and 25 millimeters in width. The total weight of the bird, including the tumor, was 35 grams. This would indicate that 28% of the total weight of the bird consisted of the tumor.

The tumor had developed from the ovary and had pushed the gizzard and proventriculus ventrally and these two organs had attached firmly to the ventral wall of the tumor so that it was only with difficulty that these organs could be dissected or separated from the tumor.

Parrakeet with Cystic Tumor of the Ovary (x ⅓).

This case is of interest because of the enormous size of the tumor compared to the total size and weight of the parrakeet.

Comparatively a tumor of like nature in a 1000-lb. cow would weigh 285 lbs.; in a 1,750 horse, 500 lbs.

* Journal Series, No. 490; contribution of the Department of Veterinary Science of the Missouri Experiment Station.

In about 1778 many thousands of these beautiful birds could be seen along the Alabama river in southern Alabama. Because of the beauty of their feathers they were killed in such numbers that they have been extinct in that state for probably 75 years.

A. J. DURANT,
Veterinary Department,
University of Missouri.
Columbia, Mo.

* * * *

DIRTY BUTTER AND NOSTRUMS

Actions brought by the Federal Food and Drug Administration against the shipments of those who have been careless in the production and handling of dairy products have been widespread. Persistent violators are being brought into court repeatedly. Seizures during November involved 1,275 pounds of unclean butter, 250 pounds of butter both dirty and low in fat content, and 210 pounds of dirty cheese.

Among the criminal cases closed during November was that against J. N. Hall, trading as the Lexington Ice and Creamery Co., Lexington, Miss. Hall had shipped a consignment of butter to New Orleans in the latter part of 1934. Government analysts found it short of the legal butterfat requirement and to contain mold, insect particles and mouse hairs. In November, Hall was fined $600 and sentenced to one year in jail. He has filed notice of an appeal.

Products seized during November included a shipment of "Poochie Worm Remover and Conditioner," a short-weight canned article consisting of water, oats, meat, hair, charcoal, fish oil and sodium and calcium chlorides and phosphates, represented in its labeling as containing more protein and fat than analysis disclosed, and offered as a conditioner, and for the removal of intestinal worms in dogs and cats, and 100 cases of a dog and cat food (biscuit), containing less protein and fat and more fibre than represented on its label, and carrying extravagant claims for the preservation of the vitality and health of animals.

Vitamins and Distemper

II. Methods of Study and Preliminary Experiments

By W. O. FROHRING
Cleveland, Ohio

Preparation of a synthetic vitamin-free milk.—Early in the course of these experiments, attempts were made to feed to newly weaned puppies the usual dry or semi-solid vitamin A-free diet. The results were not satisfactory because most of the very young puppies would not eat this diet and a large number of animals was lost. Since newly weaned puppies take milk readily, a synthetic bitches' milk was prepared which was free from vitamin A. This synthetic product has previously been reported[1] and was made to conform to the composition of bitches' milk as reported by Heineman[2]:

Specific gravity	1.035
Water	75.44
Total proteins	11.17
Fat	9.57
Sugar	3.09
Ash	0.73
Total solids	24.56

The synthetic milk was prepared by mixing vitamin A-free soluble casein (110 parts), crisco (95 parts), sucrose (30 parts), Osborn-Mendel salt mixture (7.5 parts) and linoleic acid (1.0 parts). Tap water was added to make 1000 parts, which yielded the same content of total solids as is present in the natural product. This mixture was homogenized at 3,000 pounds pressure, placed in hermetically sealed cans and sterilized in the same manner as evaporated milk (240° F. for 15 minutes, allowing 20 minutes to reach this temperature, and using a sterilizer with a revolving reel to keep the cans in constant motion during sterilization). Dried brewers' yeast or bakers' yeast was supplemented as a source of vitamin B complex and irradiated bakers' yeast as a source of vitamn D. In some of the experiments vitamin A was added in measured quantities in the form of cod liver oil or carotene.

This synthetic vitamin-free bitches' milk solved the problem of feeding the puppies and has been used successfully on several hundred animals.

Measurement of Vitamin-A Activity.—Some of the vitamins, such as carotene (pro-vitamin A) and ascorbic acid (vitamin C) can now be detected and measured by physical or chemical means, but the official method for determining a unit of vitamin activity is based on biologic assays, with young albino rats as the test animals.

The effect on growth is used in making these quantitative biologic determinations. Newly weaned rats receive a synthetic diet complete in every respect except that it contains no vitamin A. The weight curve in these animals either remains stationary or declines. When it reaches a certain point (Figs. 2a and 2b) a measured amount of the material to be tested for vitamin A content is administered. A unit of vitamin A is defined as that quantity which exerts a curative effect by increasing the animal's weight to the same degree as effected by a measured amount of previously standardized material. The details of the official technic are described in the U. S. Pharmacopoeia.[3]

To be sure that this effect is not produced by any factor other than vitamin A, two groups of animals, called positive and negative controls, are observed at the same time as the test animals. To the first group, the positive controls, vitamin A is added to the diet, which is the same in all other respects as that received by the test animals. If these control animals grow normally, it indicates that the diet was complete in all respects except as to vitamin A content.

In order to be certain that the diet given to the test animals does not contain traces of vitamin A, a number of animals are fed the same vitamin-A free diet, but never receive any vitamin A at any time in the course of the experiment. When the diet is entirely free from vitamin A, the animal always dies a short time after growth

ceases. Hence this group of animals is called the negative control group. (Figs. 3a and 3b). Figure 4 shows two puppies of the same litter. The one on the right received vitamin A in the diet at all times and was used as a positive control. The one on the left was allowed to be depleted of vitamin A, and then was given an amount of vitamin A which proved to be inadequate. At the time this picture was taken, the animal had xerophthalmia, which was later cured by the administration of double the quantity of carotene which the animal was receiving at the time the eye symptom appeared.

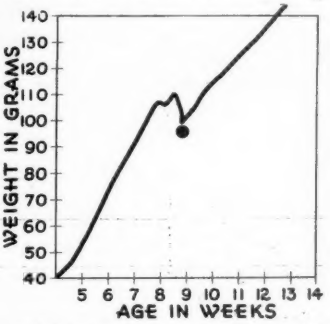


Fig. 2a. Weight curve of test rat. Curative dose was given at the spot marked. Photograph of this rat at the end of the curative period shown on the chart.

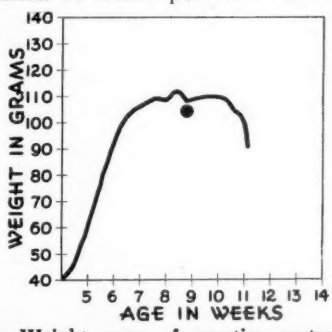


Fig. 3a. Weight curve of negative control rat used in biological assay of vitamin A activity. Black dot indicates where durative dose ordinarily would be given, but in this case was omitted. Photograph illustrates appearance of test rat at this point. Death resulted at the end of the curve.

The international standard for vitamin A is carotene. One unit of vitamin A is based on the curative biologic effect of 0.6 gamma (0.0000006 grams) of pure *beta* carotene. This is called one international unit because it is the international standard set by the League of Nations Committtte of Standards. In this country it is called the U. S. P. X. unit.

Fig. 2b. Rat referred to in Chart 2a.

Determination of Vitamin-A Reserves in Dogs and Puppies.—While vitamin A is present to some extent in most of the tissues of the body, by far the greatest proportion of the reserves of vitamin A are contained in the liver. This has been demonstrated by various workers.[4, 5, 6] Hence, the vitamin A-content of the liver may be taken as an index of the reserve store of the animal.

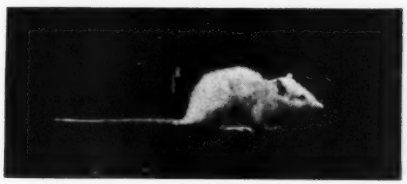


Fig. 3b. Rat referred to in Chart 3a.

At the outset of these experiments it was considered advisable to make a comparative study of the vitamin A reserves in dogs of

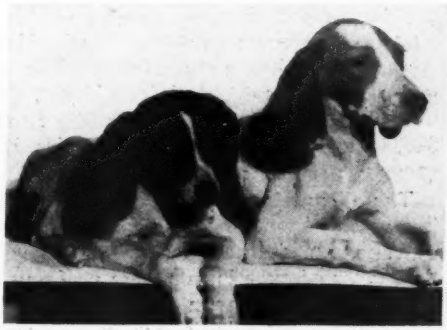


Fig. 4. Litter mates illustrating positive control on the right and puppy on the left at the time curative dose of vitamin A was started.

various ages, including those that died of accidental causes and those in which some pathologic condition was present.

Since the large number of animals studied made biologic assay impracticable, a physical method was used in which the vitamin A reserves of the liver are expressed in "blue units," as measured by the Lovibond tintometer. The first step in the method is to cut the liver into fairly small pieces. These are digested with a 10% solution of potassium hydroxide, which also saponifies the fat in the liver. The non-saponifiable fraction is extracted in a separatory funnel with petroleum ether. The petroleum ether is then removed at a reduced pressure and the non-saponifiable material is taken up in anhydrous chloroform. The addition of antimony trichloride to this yields a blue color which varies in intensity according to the quantity of vitamin A present. The depth of the color is measured on the Lovibond tintometer, and the reading is expressed in so-called blue units. By our technic, one blue unit is equivalent to 3.2 U.S.P. units of vitamin A.

TABLE 1.—VITAMIN *A* RESERVES IN THE LIVERS OF MATURE DOGS THAT DIED FROM ACCIDENT

Type	Age in Years	Cause of Death	Blue Units
Pekingese female	5	Cesarean operation	348,075
Boston terrier	2	Accident	445,000
Boston terrier female	3	Internal hemorrhage after operation	865,600

TABLE 2.—VITAMIN *A* RESERVES IN THE LIVERS OF YOUNG DOGS THAT DIED FOLLOWING ILLNESS

Type	Age in Months	Cause of Death	Blue Units
Fox terrier	5	*Subacute gastro-enteritis	2,562
Fox terrier	2	†Exhaustion (running fits)	2,099
Scotch terrier	3	**Distemper	None

*This puppy had nervous attacks.
†This puppy was treated for distemper with serum. Distemper was thought to be the primary cause of death.
**This puppy was sick for two weeks. It received distemper anti-serum two days before it died.

Tables 1 and 2 show respectively the vitamin-A reserves in a group of older dogs that died from accident and in a group of puppies that died from illness. In the mature dogs the blue units range from 348,000 to 965,000 while in the puppies the range was from zero to 2,500.

These experiments indicate that there is a vast difference in the vitamin reserves of young puppies and those of adult dogs. A number of experiments were performed to determine the vitamin A reserves in puppies that did not show any pathologic condition. In a group of puppies from four to eight weeks old, two animals from the same litter showed 2,750 and 2,700 blue units respectively. In two puppies from another litter, the blue units were 1,590 and 1,125. In a group of six puppies that were on a vitamin-A-free diet for two weeks, the values were as follows: 212, 387, 1,075, 1,275, 1,589, and 2,010. In two puppies that were on a vitamin A-free diet for four weeks, there was only a trace of blue color. In one litter of nine German shepherd puppies, none showed more than a trace of blue units in the liver, although all the dogs were normal in appearance.

From these results it is apparent that young puppies are not likely to possess an adequate reserve of vitamin A in the liver, and consequently the young growing puppy must be furnished with liberal quantities of this factor in order to avoid partial or complete vitamin A deficiency. Puppies probably need higher concentrations of vitamin A in the diet than do mature dogs, because of their rapid growth. After full growth is attained, more of the vitamin A activity in the diet is available for storage, and that probably accounts for the much higher reserves in older dogs.

The Rate of Reduction of Vitamin A Reserves in the Livers of Newly Weaned Puppies.—The experiments made to determine the quantity of vitamin A in the livers of dogs of various ages indicated fairly uniform results for the various members of an individual litter, and hence suggested the possibility of a fairly uniform storage of vitamin A in such puppies. Hence it was decided to make an attempt to study the average daily reduction of vitamin A in the livers of puppies receiving a vitamin A-deficient diet, by examining the liv-

ers of different members of the same litter at different times.

The following data are not presented as a conclusive answer to this problem, for the premise on which these experiments were founded, namely that the individual members of a litter have approximately equal reserves of vitamin A in the liver, has not been thoroughly proved on a sufficient number of animals. Furthermore, the number of animals used in these studies is too small to justify general conclusions. However, the results obtained in a small number of litters were consistent, and therefore interesting as an indication of what may take place in the bodies of young animals that are deprived of vitamin A.

Six litters of puppies were used for these observations. In the first litter of nine puppies, all the animals were destroyed when they were taken from the breast at five weeks. None of these showed any blue units in the liver. While these results yielded no figures as a basis of comparison, the results were consistent in that all the puppies in the litter showed a lack of vitamin A.

The next litter contained four puppies, six weeks old. These all showed a measurable quantity of blue units which was remarkably uniform per liver, although there was some variation in the number of blue units per gram of liver. The total number of units varied from 6,680 to 6,950, and the units per gram of liver varied from 50 to 73. (Table 3.)

Of the third litter, only two animals were destroyed when they were first received immediately after weaning. One of these showed 2,700 and the other 2,750 blue units. The other four animals received the synthetic vitamin-A free milk for two weeks, after which two more animals were destroyed. These showed 1,125 and 1,590 blue units respectively. Assuming that these animals had 2,725 blue units at the start, which was the average value for their litter mates that were sacrificed at the outset, the one had a decrease of 81 blue units per day and the other 114 blue units per day during the two weeks that they were maintained on the vitamin-free diet. Two weeks later, that is four weeks from the start of the experiment, the last two animals were destroyed. One of these showed 388 blue units and the other 212 units. This indicated a respective average decrease of 83 blue units per day for one and 89 blue units for the other.

TABLE 3.—VITAMIN RESERVES IN YOUNG PUPPIES

Number	Weight of Liver in Grams	Blue Units per Gram of Liver	Total Blue Units
D-1	122	57	6,930
D-2	134	50	6,680
D-3	102	67	6,870
D-4	95	73	6,950

The fourth litter (J-1 to J-6) was treated in the same way. J-1 showed 1,075 blue units, and J-2, 1,275 blue units, an average of 1,175 blue units at the time the animals were weaned. After two weeks on a vitamin A-free diet, J-3 and J-4 showed only a faint trace of blue color, an amount too small to measure. This indicates a decrease of 1,175 blue units in fourteen days, or an average decrease of 81 blue units per day.

The findings in this litter brought up an interesting question. When the liver reserves are depleted of vitamin A, as expressed by the test for blue units, does the animal at that time show a decrease in weight or other outward signs of vitamin A deficiency, or are the vitamin-A reserves of the liver exhausted before those of the other tissues in the body?

Since J-3 and J-4 showed only a trace of vitamin A activity in their livers, as indicated by the blue unit test, the remaining two litter mates were continued on a vitamin A-free diet. This was done in order to observe the weight curves after the point of theoretically assumed absence of vitamin A reserves in the liver. This point is indicated by "A" in Fig.5. In two weeks there was a prompt drop in the weight curves which seemed to suggest that the tissues other than the liver contain a reserve supply of vitamin A which lasted for two weeks after the reserves in the liver were exhausted. Both animals displayed signs of vitamin-A deficiency, manifested by anorexia and loss of weight at

the point marked "B" on the chart. At that time they were given 20,000 U.S.P. units of vitamin A daily in the form of carotene in oil. The animals responded promptly, as indicated by the growth curve after this

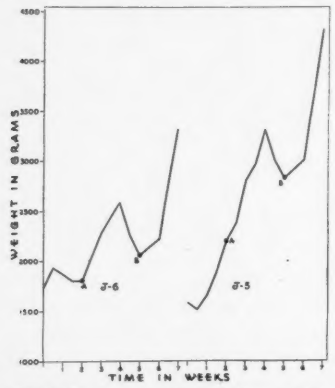


Fig. 5. Weight curves of puppies. "A"—point at which liver reserves of vitamin A were probably depleted. "B"—point at which tissue reserves of vitamin A of the body were depleted, manifested by anorexia and loss of weight.

point. The improvement in the general appearance and condition of the animals was even more marked than the increase in weight.

In two other litters, there were only three animals each. Hence only one animal in each litter was destroyed for liver assay at the outset of the experiment. In the first of these small litters, K-1 showed 1,589 blue units in the liver at the start, when it was five weeks old. Fourteen days later, K-2 was destroyed and the liver showed only a trace of vitamin A. K-3 was destroyed at the same time, and also showed only a trace of vitamin A in the liver. The reduction of blue units in this litter was therefore theoretically an average of 113 blue units per day.

L-1 in the next litter showed 2,010 blue units at the age of six weeks. In fourteen days, both L-2 and L-3 were destroyed and showed only traces of vitamin A in the liver. The theoretical reduction of blue units in this litter was an average of 143 per day.

A summary of the results of all the litters indicates roughly the depletion of at least one U.S.P. unit from the vitamin-A reserves in the liver per 10 grams of body weight per day.

Vitamin A Requirements of Puppies by the Curative Method.—In order to conduct experimental studies on the relationship of the optimum intake of the various vitamins on the general resistance of the puppy to infections, data in regard to the daily vitamin requirements were essential. No such data in regard to the need for vitamins in growing dogs were available in the literature at the time this study was started. A number of observations on vitamin A deficiency in the dog had been recorded, but none of these investigators had made any attempt to determine the minimum requirement of vitamin A.

Busson and Simonnet[7] showed that newly-born puppies have a relatively low reserve of vitamin A at birth and that at the time of weaning, the reserve is usually only moderately higher. These results are in agreement with my own observations. In experiments to determine the dog's vitamin A requirements, it appeared desirable, therefore, to use newly weaned puppies in order to shorten the necessary period of depletion, and also in order to be able to make comparisons with the vitamin A requirements of growing albino rats. With the synthetic vitamin-A-free milk already described, experiments were undertaken to determine the minimum requirements of young puppies. The preliminary results of these experiments have already been reported.[8]

In the beginning it was assumed that the requirements of the puppy for vitamin A would parallel those of the albino rat which is used for test purposes. Hence the first dosages administered to the puppies were based on the curative dose per 100 grams of body weight in the rat. These quantities, however, failed to produce a curative effect on the puppies, and a great many of the animals used at first in this series of experiments were lost. To obtain a growth response and improvement in the general condition of the animal, considerably larger quantities of vitamin A were necessary than those calculated according to the requirements of rats.

The high requirement of vitamin A in relation to body weight of growing puppies no doubt has to do with the rapidity of their growth. Figure 6 shows the growth rate of the Irish wolf hound as compared

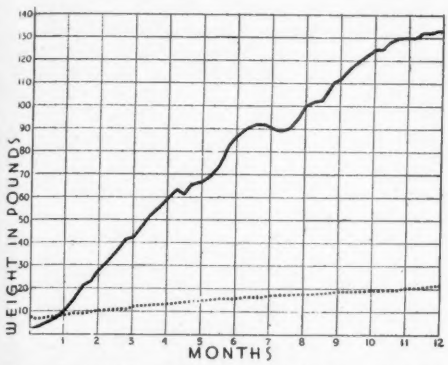


Fig. 6. Weight curves illustrating the extremely rapid growth in puppies of the larger breeds as compared with that of the human infant. Dotted line—Growth curve of the average human infant from birth to one year of age. Solid line—Growth curve of an Irish Wolf hound puppy in the same period.

with that of the human infant during the first year of life. Even dogs of medium size, such as German shepherds and collies, obtain a remarkable growth the first twelve months as compared to the human infant. It is not surprising, therefore, to find a high requirement of vitamin A in relation to body weight of the growing puppy. It is interesting in this connection that the point has often been stressed by veterinarians that the larger, faster-growing breeds of dogs are more susceptible to distemper than the smaller breeds, and also that distemper in the larger dogs is more likely to terminate fatally.

The results of the experiments to determine the vitamin A requirements of young puppies are shown in figures 7, 8, 9, and 10. When the puppies showed definite signs of depletion of vitamin A (usually in about four weeks after they were weaned), the theoretically curative doses of vitamin A were administered. After the unsatisfactory results of the earlier experiments, the quantity of vitamin A was gradually increased. The minimum curative dose which effected definite increase in weight was 20

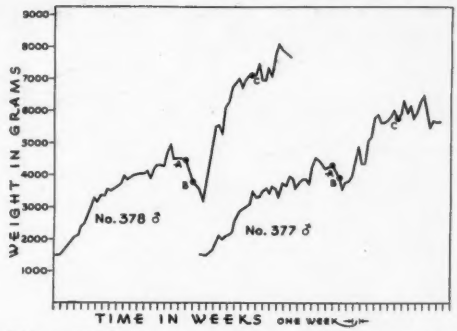


Fig. 7. Weight curves of puppies showing effects of single large curative doses of vitamin A given at the points marked.

U.S.P. units per hundred grams of body weight per day. The weight used for these figures was the weight at the time the vitamin A was restored to the diet. The maximum curative dose used in these experiments was 70 U.S.P. units per hundred grams of body weight each day. Even though these minimum curative doses may seem high, no blue units were present in the livers of any of the test animals when

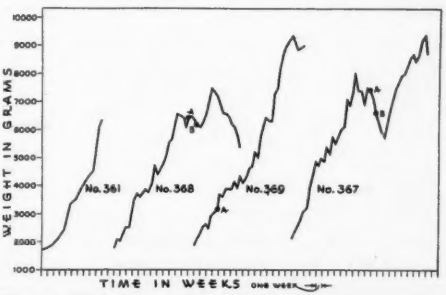


Fig. 8. Weight curves of puppies showing effects of adequate (No. 368) curative doses of vitamin A. Nos. 361 and 369 are positive controls.

they were killed at the end of the experiment.

Using these approximate curative levels (20 to 70 U.S.P. units per day) experiments on large numbers of puppies at various stages of vitamin A depletion would be necessary to obtain the minimum curative level with greater accuracy. Experiments to obtain these data are planned for some future date.

Carotene in cottonseed oil was used as a source of vitamin A activity in all of the

animals except puppies 368 and 378. These received cod liver oil.

The procedure was varied in the case of puppies 377 and 378. These two were from

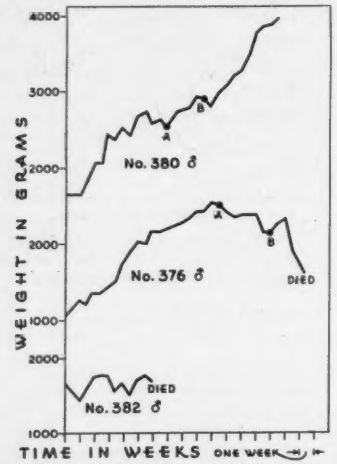


Fig. 9. Typical test puppy weight curves. No. 382—negative control. No. 376—given insufficient curative dose of vitamin A. No. 380—At "A", slightly insufficient dosage of vitamin A was given. At point "B", dosage of vitamin A was depleted resulting in more marked response.

the same litter and were rather slow in depleting their reserves of vitamin A, probably because they possessed a greater than average store in the liver when they were received. Instead of giving them daily curative doses of vitamin A, large single doses were administered, with the growth response indicated on the chart. Animal 377 received vitamin A in the form of carotene in oil, and 378 received cod liver oil.

References

1. Frohring, W. O., 1934. A Synthetic Vitamin A-Free Milk Suitable for Vitamin A Studies in Very Young Puppies. Proc. Soc. Exp. Biol. and Med., **32**:1021-1024.

2. Heineman, P. G. Milk, 1921. W. B. Saunders Company, Philadelphia.

3. Vitamins A and D Assays for Cod Liver Oil, 1935. U.S.P. XI:478-482.

4. Simonnet, H., and Busson, A., 1932. Compt. rend. Soc. Biol. **109**:716-717.

5. Pariente, A. C. and Ralli, E. P., 1932. Presence of carotenase in the liver of the dog. Proc. Soc. Exp. Biol. and Med. **29**:1209-1210.

6. Simonnet, H., Busson, A. and Asselin, L., 1932. Compt. rend. Soc. Biol. **109**:182-183.

7. Busson, A. and Simonnet, H., 1932. Variation de la reserve en vitamine A du foie suivant l'age chez le chien. Compt. rend. Soc. Biol. 109:1253-1254.

8. Frohring, W. O., 1935. Vitamin A requirements of growing puppies. Proc. Soc. Exper. Biol. and Med. **33**:280-282.

Note.—This is the second of a series of articles by the same author on the subject of vitamins and distemper in dogs. The third article of this series will appear in an early issue.—*Editor.*

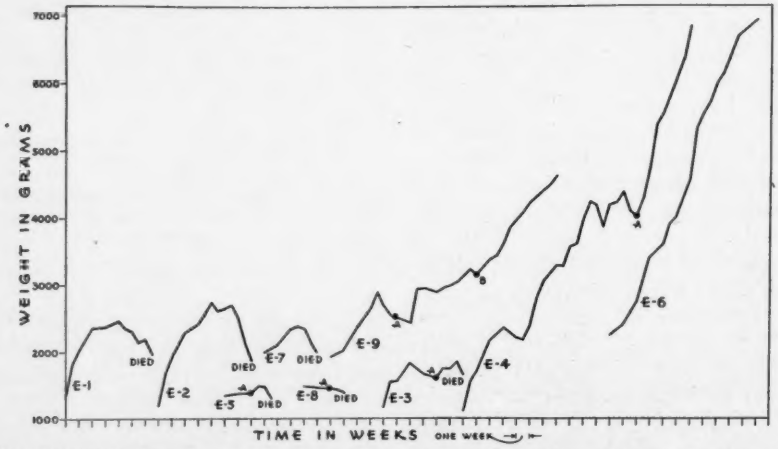
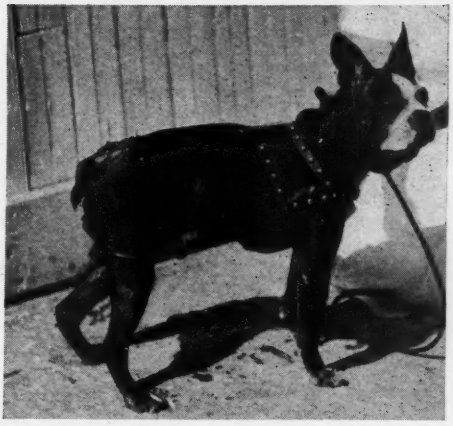


Fig. 10. Weight curves of an entire litter of puppies used for vitamin A test purposes. E-1, E-2 and E-7 are negative controls. E-3, E-5 and E-8 were given what proved to be insufficient curative doses. E-9 was given at "A" an amount which was not the optimum. At "B" the dosage was doubled, which resulted in an improvement in weight curve. E-4 was given at "A" an entirely adequate curative dose of vitamin A. E-6 is a positive control.

"LEATHERPANTS" FOR PERINEAL HERNIA

A novel and comfortable method controlling perineal hernia in old dogs where an operation is not advisable is shown in the accompanying illustration.

This truss-like arrangement consists of a piece of thin cow-hide brought over the hind-quarters and halfway down and around the hind legs, notched and laced together again in order that it may fit smoothly, with a small piece removed in the back to permit movement of the tail and normal defecation. The leather support is held in place by three strips of elastic ribbon; one end of each being attached to the leather truss and the other end to an ordinary dog harness. They stretch sufficiently to permit free movement.



Although this arrangement fits loosely, it furnishes sufficient pressure to prevent protrusion and I have never known a case to show evidence of any discomfort. In fact, the dog photographed actually whines for his "leatherpants" whenever they are removed.

F. L. VINSON.

Baltimore, Md.

* * * *

CONSUMER MEAT-GRADING REGULATIONS ANNOUNCED

Rules and regulations covering consumer grading and stamping of meats and meat products have been announced by the Bureau of Agricultural Economics. They supersede rules and regulations issued in 1926 when meat grading was begun by the Bureau.

The service has been expanded greatly since then to include the grading and stamping of beef, pork, lamb, mutton, and sausage products. Within the last year more than 420,000,000 pounds of these foods were graded and stamped by the Bureau in 22 central markets within an area extending from New York to San Francisco, and from St. Paul to Oklahoma City.

The meat grading and stamping service is voluntary. It is paid for by the applicants which include packers, distributors, hospitals, restaurant chains, steamship lines and various city, state and Federal govern-

ment agencies which are large purchasers of meats.

The regulations include special definitions of 276 foods and soft drinks. The following are illustrative:

Flesh.—Any edible part of the striated muscle of an animal. The term "animal," as herein used, indicates a mammal, a fowl, a fish, a crustacean, a mollusk, or any other animal used as a source of food.

Meat.—The properly dressed flesh derived from cattle, from swine, from sheep, or from goats, sufficiently mature and in good health at the time of slaughter, but restricted to that part of the striated muscle which is skeletal or that which is found in the tongue, in the diaphragm, in the heart, or in the esophagus, and does not include that found in the lips, in the snout, or in the ears, with or without the accompanying and overlying fat, and the portions of bone, skin, sinew, nerve, and blood vessels which normally accompany the flesh and which may not have been separated from it in the process of dressing it for sale. The term "meat" when used in a qualified form, as, for example, "horse meat," "reindeer meat," "crab meat," etc., is then, and then only, properly applied to corresponding portions of animals other than cattle, swine, sheep, and goats.

Milk.—The whole, fresh lacteal secretion obtained by the complete milking of one or more healthy cows, excluding that obtained within 15 days after calving, or such longer period as may be necessary to render the milk practically colostrum-free. The name "milk" unqualified means cow's milk.

Pasteurized Mil.—Milk every particle of which has been subjected to a temperature not lower than 142° F. for not less than 30 minutes and then promptly cooled to 50° F. or lower.

Butter.—The food product usually known as butter, and which is made exclusively from milk or cream, or both, with or without common salt, and with or without additional coloring matter. It contains not less than 80 percent by weight of milk fat, all tolerances having been allowed for.

* * * *

No activity of veterinary medicine offers more promising results than does the attack upon the problem of poultry disease control with the weapons which modern sanitary science is placing at our disposal. It is perhaps safe to say, at the same time, that no other group of animal husbandmen has been and still is so viciously bombarded with proprietary agents of all descriptions as are poultry producers.—*Leo F. Rettger.*

SEVENTEENTH ILLINOIS VETERINARY CONFERENCE

The seventeenth annual veterinary conference held at the University of Illinois, November 12 to 14, 1936, was attended by about 150 veterinarians of the state. The program arranged by Dr. R. Graham of the Division of Animal Pathology and Hygiene of the University included discussion of Bang's Disease, Poultry diseases and Rabies. Members of the faculty, officials of the Illinois Department of Health, Illinois practitioners, and Dr. H. E. Moskey of the Federal Food and Drug Administration contributed to the program.

On the following page are halftones of a number of those in attendance, their names and addresses being, left to right:

Top row: E. D. Rhoades, Lincoln; W. M. Kyle, Lebanon; F. C. Jones, Macomb; E. E. Robinson, Mazon; C. A. Cox, Fithian; W. R. Spesard, Shelbyville; G. C. Kendall, Lincoln, and I. S. Alford, Paxton.

Second row: A. E. Campbell, Rantoul; D. A. Cahill, Monticello; G. A. Firth, Delavan; P. J. Meginnis, Champaign; Robert Graham, Urbana; L. A. Merillat, Chicago; D. M. Campbell, Chicago, and E. E. Gieske, Wheeling.

Third row: C. L. Miller, Oak Park; C. B. White, Stanford; A. J. Pilon, Champaign; Fred O. Conover, Sr., Petersburg; H. E. Moskey, Washington, D. C.; C. C. Hastings, Williamsville; O. N. Christensen, Chicago, and T. M. Bayler, Bloomington.

Fourth row: Fred H. Conover, Jr., New Berlin; F. E. Johnson, Arcola; A. J. Coale, Carmi; W. A. Weldon, Dwight; C. B. Hawes, Poplar Grove; S. D. Buzzard, Stewardson; C. F. McKinney, Arthur, and C. A. Van Ausdall, Edinburg.

Fifth row: E. O. Smith, Princeville; Basil Bennett, Shawneetown; A. B. Pletsch, McNabb; M. H. Wills, Ridge Farm; P. C. Fletcher, Geneva; L. W. Swindlehurst, Heyworth; E. E. Slatter, St. Joseph, and Frank G. Loomis, Yorkville.

Sixth row; C. A. Brandley, Urbana; O. W. Winters, Danville; H. C. Shults, Blue Mound; W. E. LeCroy, Fairfield; L. A. Gray, Bushnell; J. R. Brown, Ottawa; A. W. Smith, Farmer City, and J. L. Walcher, Nokomis.

Seventh row: H. L. Campbell, Tuscola; A. H. Davison, Urbana; J. E. Salstrom, Paxton; W. C. Roe, Paxton; E. L. Blumenshine, Washington; H. L. Keene, Shabbona; A. T. Peters, Peoria, and C. J. Buehler, Morton.

Eighth row: G. W. Jensen, Antioch; J. F. Gillespie, Tuscola; David Smith, Peoria; A. E. Bott, East St. Louis; Mr. J. P. Stout, Springfield, Superintendent, Division of Animal Industry, Illinois Department of Agriculture; Harry Caldwell, Wheaton; W. B. Holmes, Springfield, and J. P. Torrey, East St. Louis.

Canine Nutrition

By R. G. LINTON, Ph.D., M.R.C.V.S.,
Department of Hygiene,
Royal (Dick) Veterinary College, Edinburgh, Scotland

IT IS a curious fact that whereas the dog has been utilized to a greater extent than any other domestic animal for nutritional studies by physiologists and was the first animal to be domesticated, veterinarians and dog breeders hold most divergent views concerning both the kind of food best suited to the dog and the manner in which it should be given. The subject of this communication is of particular interest at the moment for several reasons. The suggested association between that peculiar disease "canine hysteria" and nutrition has been the cause of much debate; indeed, commercial dog foods have so persistently been credited with being the primary cause of this disease that manufacturers in many cases have suffered considerable financial losses from sale depreciations.

The increase of controlled greyhound racing during recent years has drawn the attention of owners and managers to the need for establishing some method of feeding which will keep the dogs racing-fit and free from nutritional disorders; and it is of interest that this has been responsible for the introduction of a method of feeding certainly new to Britain. Various theories concerning the feeding of dogs have been discussed at some length during the past year in the American veterinary publication VETERINARY MEDICINE; it is therefore perhaps not inappropriate that canine nutrition should form one of the subjects for discussion at an International Veterinary Congress held in New York.

The dog was originally a carnivorous animal; domestication turned him into an omnivore with a later tendency to restrict his diet to cereals only. The domesticated dog may be reared on the diet of an omnivore, that is, a mixture of flesh and carbohydrate; a diet restricted to cereals and legumes and their byproducts would be wholly inadequate.

Satisfactory answers still have to be determined to the ever-recurring questions addressed to the practicing veterinarian: "What shall I give my dog to eat, and how much of each kind of food?" The problem is rendered the more difficult because of the great variety of dogs to be catered for and to the different conditions under which these animals are kept, some dogs being subjected to hard work, calling for a highly nutritious and liberal diet, while pets require little more than maintenance food.

This paper is an attempt to collate such experimental evidence as there is available concerning canine nutrition and also to review current opinions which may assist the veterinarian in his endeavor to give reasoned advice to dog owners on the all-important subject of feeding.

Quantity of Food Required

The quantity of food which should be given to a dog naturally depends upon the amount of work or exercise undertaken by the animal. Appetite capacity cannot be taken as a guide, because the dog's inherited instinct is to eat to its maximum when food is available. The quantity of food should be such as will keep the animal in good health but not fat. Shepherds' dogs, which are the hardest worked and probably the healthiest animals, are never obese. It is unnatural for a dog to be fat. It is believed that a satisfactory answer to the question so frequently put to veterinarians regarding the quantity of food which should be given to dogs is supplied by Dechambre's standard of nutrient requirements. Dechambre compiled the table of nutrients, which is reproduced here, by determining the maintenance requirements in accordance with the well-known surface law, which is applicable to dogs as well as to horses and cattle. We believe this table to be sound in principle and that it will be of great assistance to the veterinarian.

The energy value of diets may be expressed in various ways. Dechambre has adopted the nutritive unit system, a nutri-

* Presented at the Twelfth International Veterinary Congress, New York, N Y., August 13-18, 1934.

TABLE 1, *Dechambre's Table of Nutritive Requirements for Dogs*[1]
(Food weight in grams)

Weight of dog in kg	Protein			Fat			Carbohydrate			Total nutritive units		
	Maintenance	Moderate work	Hard work	Maintenance	Moderate work	Hard work	Maintenance	Moderate work	Hard work	Maintenance	Moderate work	Hard work
5	18	30	33	5	6.5	8.5	100	125	165	130	170	217
10	30	50	55	8.5	11	14	165	211	275	214	285	360
15	36	60	66	10	13.5	16.5	200	250	330	270	340	420
20	45	73	81	12	16	20	245	308	405	316	416	530
27	55	90	100	15	20	25	300	380	500	388	514	655
40	72	117	130	20	26	33	390	494	650	505	668	850
50	83	135	150	23	30	38	450	570	750	583	771	983
60	94	153	170	26	34	42.5	510	645	850	660	873	1,113
64	98	160	177	27	36	44	531	673	885	690	914	1,160
80	113	185	205	31	41	51	630	780	1,025	811	1,055	1,342
90	124	202	225	34	45	56	675	855	1,125	874	1,165	1,473
100	132	216	240	36	48	79	720	912	1,200	932	1,233	1,613

tive unit being the sum of the protein, fat, and carbohydrate, the fat being given a value 2.2 times greater than the carbohydrate or protein. If the nutritive value is expressed in calories per gram of food, the calorific value for the constituents of concentrated nonfibrous food applicable for human beings may also be utilized for the dog. These are: Protein, 4.1 C.; fat, 9.3 C.; and carbohydrate, 4.1 C. Thus according to Dechambre's standard, a dog of 27 kilograms doing moderate work would require 90 grams of protein, 20 grams of fat and 380 grams of carbohydrate, having a total calorific value of 1.558. Assuming Dechambre's standards to be correct, these food values are of importance because, by making use of them balanced rations can be compounded from a great variety of foods the analyses and calorific values of which will be found in any book on human dietetics. Space does not permit the reproduction of these analyses here.

It is of interest to note to what extent diets which have been found satisfactory in practice agree with the suggested standards. For this purpose a critical analysis is given in table 2 of the rations used in two greyhound racing kennels (the dogs weighing 27-29 kilograms), and that used in the clinical department of this college; these are compared with Dechambre's standard. It will be noted that the quantities of protein, fat and carbohydrates given in the college diet agree closely with the standard but in the diets for the greyhounds the amount of protein allowed is considerably greater.

As biscuits frequently form the sole diet of dogs, the nutrients supplied in approximately the same weight of food, 500 grams of dry matter have been calculated from our chemical analyses and included in the survey. It will be clear from a study of table 2 that the quantity of protein, fat and carbohydrate supplied is very variable; indeed it will be clear that unless the composition of the biscuits is declared and guaranteed by the manufacturer, the purchaser can have no idea of the quantity of each constituent he is feeding.

Proportions in Which the Food Constituents Should Be Combined

With the dog's natural diet the proportions of fat to protein will vary, of course, with the condition of the food-animal carcass; in lean beef the proportion is approximately 10:140 and in a "half finished" carcass 10:40. In fresh horse flesh which we have analyzed on various occasions the ratio of fat to protein was approximately 10:70. It is well known that a certain minimum amount of fat is necessary in the diet of animals and also that excessive fat causes digestive disturbances.

As it is generally considered advisable and often necessary, for reasons of economy, to substitute part of the flesh by carbohydrate, it becomes a matter of some importance to know to what exent he substitution may be effected without impairing the nutritive value of the diet as a whole. The proportions of protein, fat and carbohydrate found to be satisfactory for human beings taking a moderate amount of muscular exercise are 10.7:10.68. The

TABLE 2, *Nutrients Supplied in Some Diets and in Equivalent Weight of Dog Biscuits*

(Weight of dog 27-29 kg; food weights in grams calculated to 100% of dry matter)

Diet	Protein	Fat	Carbohydrate	Fiber	Nutritive units	Nitrogenous ratio	Silica-free ash	Calcium oxide	Phosphorus pentoxide	Chlorine	Calcium-phosphorus ratio	Dry matter in grams
Dechambre:												
Moderate work	90	20	380	------	514	1:4.7	------	------	------	------	------	490
Hard work	100	25	500	------	655	1:5.6	------	------	------	------	------	625
Greyhound kennels (1):												
Meat and vegetable broth	95.3	12	183	7.1	------	------	12.7	0.39	2.92	3.90	------	------
Milk	13.7	13.7	18.8	------	------	------	2.9	.59	.90	.39	------	------
Whole-meal bread	26.3	1.6	109	3.2	------	------	4.3	.10	.57	1.70	------	------
Total	135.3	27.3	310.8	10.3	506	1:2.7	19.9	1.08	4.39	5.99	1:2.5	483.7
Greyhound kennels (2):												
Meat and vegetable broth	85.5	21.9	203	3.0	------	------	16.7	.85	3.02	6.90	------	------
Milk	15.4	15.4	21	------	------	------	3.3	.66	1.01	.44	------	------
Whole-meal bread	28.3	2.3	148	1.6	------	------	10.1	.56	1.13	3.08	------	------
Total	129.2	39.6	372	4.6	588	1:3.5	30.1	2.07	5.16	10.42	1:1.5	545.4
Royal (Dick) Veterinary College:												
Fresh horse flesh, 200 grams	37.8	6.0	------	------	51	------	2.1	.02	.89	.12	1:27.2	------
Biscuits, 450 grams	72.9	17.5	350	1.26	461	------	7.9	3.78	3.08	2.16	1: .5	------
Total	110.7	23.5	350	1.26	512	1:3.6	10.0	3.80	3.97	2.28	1: .6	500
Biscuits:												
(1)	121	53.0	298	.55	536	1:3.4	26.8	5.80	8.80	1.10	1: .9	500
(2)	98	27.7	353	2.60	512	1:4.2	18.2	4.85	6.40	3.55	1: .8	500
(3)	81	3.0	408	2.70	496	1:5.1	5.4	1.55	2.40	.75	1:1.0	500
(4)	81	19.5	389	1.40	513	1:5.3	8.8	4.20	3.40	2.40	1: .5	500
(5)	88	16.0	382	6.85	505	1:4.7	7.4	.35	2.60	2.10	1:4.5	500
(6)	62	13.4	403	2.80	495	1:7.0	13.6	6.75	7.25	1.55	1: .6	500
(7)	90	14.9	366	14.40	489	1:4.4	13.8	.35	3.75	5.05	1:6.5	500
(8)	89	6.6	374	12.85	478	1:4.4	17.7	.40	4.60	4.45	1:7.0	500

proportions for a dog as recommended by Dechambre and those found by the analysis of successful diets are given in table 3.

Proportions in Which the Food Constituents Should Be Combined

TABLE 3

Proportions of Protein, Fat and Carbohydrate in Dogs' Diets

Diet	Protein	Fat	Carbohydrate
Dechambre's recommendation	45	10	190
Greyhound kennels (1)	50	10	110
Greyhound kennels (2)	33	10	94
Royal (Dick) Veterinary College	47	10	150

It is seen from these figures that there is a fairly close agreement in the proportion of protein to fat, but the quantity of carbohydrate is more variable.

It is suggested that in a diet for a dog getting a reasonable amount of exercise the proportion of protein to fat should be 45-50:10, and that the carbohydrate should not greatly exceed 15 times the quantity of fat in the diet. While no experimental work appears to have been done to determine the optimum amount of fiber in a dog's diet, numerous investigations have been undertaken to ascertain the extent to which the dog can digest fiber. A review of this work is given by Mangold[2], who points out that although the digestive system of carnivores is not naturally adapted for plant food the dog may develop an intestinal flora which makes possible the digestion of a certain amount of fiber, and that the house dog which is fed as an omnivorous animal will ingest cellulose-splitting bacteria. In what appear to be satisfactory diets we have found the fiber to range from 0.25% in a diet of biscuit and horse flesh to 2.13% in a diet consisting of vegetables, meat, broth, etc.

To summarize, then, it is suggested that an average diet for a dog should contain: Protein, 22%; fat, 5%; carbohydrate, 70%; fiber, 0.5%; ash, 2.5%.

Kinds of Food Given to Dogs

The foodstuffs given to domestic dogs nowadays range through a great variety of materials. These include dog biscuits, which are in themselves extremely variable in composition, cereals of all kinds, leguminous seeds, leafy vegetables, roots and tubers, animal flesh, fish and milk.

Dog Biscuits

Over a long period of time dog biscuits have formed the chief food of dogs. They probably became popular because they were convenient, and some manufacturers found that their sale afforded a ready means of disposing of otherwise unmarketable material (waste flesh tissue) in a profitable manner. The foundation of these biscuits has always been wheat flour, and for a long time two types predominated—the plain biscuit, which consisted of baked wheat flour to which salt may or may not have been added, and a similar biscuit containing some cooked refuse flesh. In later years many manufacturers have modified and greatly improved their products by adding various other commodities to the flour. In those countries where rye is cheaper it may be used instead of wheat in the manufacture of dog biscuits. Lössl[3] obtained good results from the use of rye in a feeding experiment on puppies and logically points out that the use of rye flour in dog biscuits, besides providing a suitable cereal dog food, opens a market for the disposal of the surplus of rye-growing countries.

Rendering Works Products Unsuitable

Dog biscuits to which waste flesh tissues have been added belong to a different category, not so much because they contain animal protein but because of the undesirable nature of the material which is so often used. In many cases this consists of "tallow craft" or "cracklings"—muscle fibers, gristle, cartilage and skin fragments—residue from boiling the flesh and rendering down the fat from waste meat, and carcasses of animals that have died from disease. These carcasses are often in an advanced state of decomposition before they are received at the factory. In several samples pieces of skin with the hairs attached have been found, and this material has definitely been shown to be the cause of illness and death of dogs. Hudson[4] has placed on record the illness and death of retrievers when the food consisted only of tallow craft and maize meal. One has no hesitation in stating that dog biscuits containing tallow craft or the flesh obtained from cadavers are unsuitable for dogs, and in particular, for the more delicate, pampered animals. These biscuits should be distinguished from those containing sound flesh obtained from healthy animals; unfortunately the purchaser cannot tell the good from the bad, and on chemical analysis many of the inferior kinds of biscuits containing waste flesh show a high protein content, which may be misleading.

Within comparatively recent years some manufacturers have taken a great deal of trouble to produce a better grade of article. Many dog biscuits are now made of whole wheat flour with additions, in some instances, of wheat germ, dried milk, egg yolk, cod liver oil and various kinds of mineral mixtures.

Dog Biscuits and Fright Disease

In view of the fact that there has been so much discussion during recent years concerning the nutritive value of dog biscuits and that they are frequently blamed for causing hysteria, we have analyzed a large number of biscuits and composite dog foods. Some of these were sent with the definite statement that they invariably cause hysteria (number 1-10 in table 5), while the others (numbers 11-15) it was stated with equal assurance that they cure hysteria. The remainder (16-27) were taken at random from the many stock samples we have analyzed.

An examination of table 4 shows that there is great variation in the proportions of the constituents; thus the protein varies from 12.33% to 24.23%, the ether extract from 0.34% to 10.63%, the nitrogen-free extract from 59.56% to 82.34%, the fiber from 0.11% to 6.21%, the acid soluble ash from 1.08% to 7.37%, the calcium (as CaO) from 0.07% to 3.29%, chlorine from

0.12% to 1.19%, phosphorus (as P_2O_5) from 0.45% to 2.19%, and the Ca/P ratio from 1:0.08 (biscuit No. 24) to 1:7.02 (biscuit No. 15).

It will be clear then, that the dog owner may purchase foods which differ widely in the proportion in which the constituents are compounded. Thus, one biscuit contains more than 40 times the calcium present in another, and the calcium-phosphorus ratio, which may be of importance to the young animal when the supply of these minerals is less than luxus consumption, has, as indicated above, an extremely wide range. We have found no marked differences between biscuits said to cause hysteria, and those said to cure it. The percentage of chlorine is lower, on the average, in biscuits alleged to cause hysteria than in those said to cure it, and in this connection it is interesting to note that hysteria is sometimes treated by subcutaneous injections of normal saline. On the other hand, the natural food of dogs actually contain less chlorine than is present in biscuits; we have found horse flesh to contain 0.06% (0.24% calculated on a dry-master basis), and 0.064% in fresh minced beef. Thus the quantity of chlorine given in 200 grams of fresh horse flesh is only 0.12 grams, whereas a similar amount of dog biscuit of average composition may contain 10 times the amount.

TABLE 4, *Chemical Composition, in Percent, of Dog Biscuits*
(Dry Matter Basis)

Biscuit no.	Crude protein	Ether extract	Nitrogen-free extract	Crude fiber	Acid-soluble ash	Calcium oxide	Chlorine	Phosphorus pentoxide	Calcium-phosphorus ratio
Biscuits Said to Cause Hysteria									
1	24.23	10.63	59.56	0.11	5.36	1.16	0.22	1.76	1:0.93
2	20.91	4.05	71.86	.29	2.81	.75	.50	.94	1:0.77
3	19.72	2.84	74.41	.84	2.10	.51	.28	.85	1:1.02
4	19.64	5.55	70.58	.52	3.64	.97	.71	1.28	1:0.81
5	17.46	3.19	76.36	1.37	1.48	.07	.42	.52	1:4.54
6	16.18	.60	81.58	.54	1.08	.31	.15	.48	1:0.95
7	16.20	3.89	77.77	.28	1.76	.84	.48	.68	1:0.50
8	18.17	3.00	72.65	1.07	4.96	1.68	.34	2.01	1:0.73
9	20.02	2.78	73.12	.38	3.59	1.06	.50	1.35	1:0.78
10	16.09	.34	79.83	0	3.67	.88	.15		
BISCUITS SAID TO CURE HYSTERIA									
11	12.33	2.67	80.65	0.56	3.72	1.35	0.33	1.45	1:0.66
12	18.09	2.98	73.27	2.87	2.75	.07	1.01	.75	1:6.55
13	16.32	1.79	76.98	1.98	2.85	.09	.98	.68	1:4.62
14	16.43	2.05	72.33	6.21	2.89	.14	.98	.66	1:2.88
15	17.73	1.32	74.79	2.57	3.54	.08	.89	.92	1:7.02
OTHER BISCUITS									
16	22.65	4.80	68.51	1.12	2.76	0.49	0.47	1.14	1:1.42
17	16.02	4.60	76.51	.84	1.93	.28	.34	.89	1:1.94
18	20.85	3.60	68.27	1.39	5.68	2.07	.52	2.19	1:0.65
19	18.80	2.80	74.48	.22	3.62	1.16	.50	1.25	1:0.66
20	12.07	4.50	80.03	1.27	2.06	.11	.62	.54	1:3.00
21	17.68	1.70	76.67	.95	2.98	.09	1.16	.63	1:4.28
22	17.00	4.33	75.77	1.04	1.84	.11	.46	.68	1:3.78
23	18.00	1.65	75.82	1.54	2.96	.08	1.19	.67	1:1.52
24	15.26	1.62	74.75	.88	7.37	3.29	.52	.45	1:0.08
25	12.81	1.66	82.34	.90	2.26	.85	.12	.54	1:0.39
26	16.32	1.51	80.43	.27	1.45	.10	.16	.71	1:4.34
27	18.00	5.74	73.90	.21	2.10	.49	.25	.84	1:1.05

Requirements of Nursing Bitches

Pregnant or nursing bitches and young growing dogs require a liberal supply of minerals. Bitches' milk has the following composition:[5]

Water	80.1%
Fat	8.5%
Lactose	2.8%
Ash	1.3%

the mineral composition being:

CaO	0.45%
MgO	.02%
K_2O	.14%
Na_2O	.08%
P_2O_5	.51%
Cl	.16%

The Ca/P ratio is 1:0.69.

When the diet is restricted to ordinary wheat-flour biscuits, the pregnant or nurs-bitch cannot possibly obtain a sufficient amount of minerals to supply the quantities secreted in the milk. If raw beef or horse flesh is added to the diet, the position is not improved but rather the reverse because fresh horse flesh contains only 0.01% calcium oxide and 0.45% phosphorus pentoxide, having calcium-phosphorus ratio of 1:27, and fresh minced beef 0.017% calcium oxide and 0.36% phosphorus pentoxide with a calcium-phosphorus ratio of 1:13. But it must be remembered that under natural conditions of feeding, the dog would consume large quantities of bones and thus get an abundance of both calcium and phosphorus. The necessity for supplying crushed bone, such as the ribs of calves slaughtered for veal, or sterilized bone flour is clearly indicated. Prof. P. Dechambre and E. D. Dechambre[6] state that while it may be possible to feed an adult dog on food different from that of a wild or natural dog, this does not apply to puppies. These authorities stress the fact that young dogs in particular need raw meat and raw liver.

Horse Flesh

Veterinarians and dog owners in recent years have expressed strong differences of opinion regarding the suitability of horse flesh for dogs. Spaulding[7] states that in his clinical experience dogs did not thrive on horse meat and that in kennels where horse meat was used, unthriftiness, digestive disturbances, and eczema were common, and that the condition of the dogs improved when ox beef was substituted. So definite are the opposing views on the nutritional value of these two kinds of flesh that one manufacturer of dog food will advertise the fact that the meat is all beef, while another will stress the fact that his commodity contains horse flesh and guarantees that there is no beef in the tin. It has been rightly pointed out that horse flesh has been the staple meat diet for dogs for unnumbered years and that it is often the only food given to carnivores in zoölogical gardens. Metabolic experiments carried out by Harris[8] showed that the dog retains more nitrogen from horse flesh than from beef and that the digestibility of horse flesh is slightly greater. From these experiments it is evident that weight for weight horse flesh has a higher nutritive value than beef.

In this college horse flesh is given daily to the dogs in the hospital and this has been the practice without untoward result for many years. It is true that when horse flesh, particularly if raw, is given in generous quantity to dogs unaccustomed to it digestive and intestinal disturbances will result, but this is true concerning the misuse of any food. One point perhaps has been overlooked: The vitamin content of the tissues is possibly lower in town horses than in horses kept in the country, and fed during the summer months on grass. One may surmise, therefore, that a diet of white wheaten flour biscuits, plus the flesh of town horses, is not in itself a biologically complete diet for dogs. The addition of cod liver oil or beef suet is therefore indicated.

Not many nutritional experiments have been made with commercial dog foods except by manufacturers for their own information, but reference may be made to a study of the growth and antirachitic factors of a prepared dog food stated to be basically a horse-meat product consisting of muscular and glandular tissues of range-reared animals. Harris and Darling[9] found that the food when tested on standard rats contained adequate amounts of vitamins A, B and D. Lössl,[10] who has carried out extensive feeding experiments with dogs in Berlin, compared the nutritional value of fresh horse meat with raw mince meat, whole milk and soya biscuits, and found the utilization of the protein to be the same, 96%, for beef and horse flesh.

Vegetables

When the attention of nutritionists had become focussed upon the important rôle of vitamins in maintaining health, it naturally followed that the veterinarian should consider their significance in the diet of dogs. Somewhat irrationally it was thought that raw vegetables would be beneficial, and dogs were given raw carrots, swedes (rutabagas), and turnips. This was done

principally to supply vitamin C, though it is now known that the dog does not require this vitamin in its food. Though it is now generally agreed that raw vegetables of any kind are unsuitable for dogs, there are differences of opinion regarding the use of cooked vegetables.

In a comprehensive paper on the nutrition of the dog, Spaulding says that in spite of the desperate efforts of man to make the dog a vegetarian, the digestive tract still remains that of a carnivorous animal. One cannot but agree with Spaulding's observations that, because of the anatomical formation and relative sizes of the large and small bowels of the dog, the food should be of a concentrated nature and that the use of bulky fibrous foods is contraindicated. Spaulding is not in favor of giving dogs large quantities of vegetables, such as potatoes, carrots, beets and turnips, which he says, they digest with difficulty or not at all; he has demonstrated that cooked carrots are for the most part voided in an undigested state. It is true, as this author points out, that the more hardy breeds of dogs and those kept on farms, etc., may be able to deal with the fibrous and unnatural diets more satisfactorily than the more delicate animals. It has, however, been shown experimentally, according to Rubner,[11] that dogs can digest potatoes quite well, but this does not necessarily mean that potatoes form an ideal food for dogs. Experience has shown that their extensive use leads to nutritional disturbances, the nature of which is not quite clear. In Spaulding's opinion cereals form an excellent adjunct to meat provided that they are dehydrated into a small cake and not fed in a sloppy condition.

Feed of Race Greyhounds

In marked contrast to the views just quoted are those held by veterinarians in charge of greyhound-racing establishments in Britain. In these kennels considerable quantities of vegetables are given to the dogs, and most of the food is given in the form of broth. The practice followed is definitely contrary to generally accepted ideas, but one cannot ignore the fact that apparently excellent results are obtained by this seemingly irrational system.

In one center the dogs are given the following mixed diet, which is divided among 160 to 170 dogs of about 27 to 29 kilograms in weight:

	Kg.	When given
Onions	3.6	daily
Pearl barley	3.6	"
Carrots	4.1	For 6 days
Ox cheeks	4.1	" " "
Large cabbages, 5	.....	" " "
Filleted fish	50.8	1 day a week

The above quantities of vegetables and meat are thoroughly boiled and served in the form of a slop, salt being added to the mixture. In addition to this food, 109 grams of raw beef are given to each dog daily. The only meat used is beef. Four liters of fresh whole milk and 89.8 kg. of whole-meal bread are also divided among the dogs daily. One day of the week a lighter diet is given, consisting chiefly of bread, milk and fish. They are fed twice a day, the bread and milk being given in the morning and the composite soup in the evening. The veterinary surgeon in charge of these kennels, about 200 dogs, says that there is remarkable freedom from disease of any kind and that skin diseases are practically unknown. He attributes the healthy condition to the large amount of vegetables consumed.

The type of feeding just described is representative of that adopted in other greyhound kennels in Britain. Samples were taken at the time of feeding from two such establishments, evaporated to dryness, and ground to a powder and analyzed. In one of these establishments the dogs are given 212 grams of brown bread and 379cc of fresh whole milk in the morning, and for the evening meal brown bread (whole meal) soaked in meat broth containing boiled barley, carrots, cabbages and beef. The morning and evening meal together were found to contain: Protein 135.5 gm; fat. 27.2 gm; nitrogen-free extract, 310.8 gm; and fiber, 10.3 gm. An analysis of these two diets is given in table 2.

A diet which has attracted interest in America is that propounded by Whitney[12] who found difficulty in rearing healthy litters. He therefore changed his method of feeding and obtained good results when he

adopted a diet of crumbled whole-wheat bread, white bread, or maize meal, heated with boiling water, to which was added alfalfa-leaf meal, ground fish, beef suet, and ground bone; the proportions of protein, fat and carbohydrate were 22:20:48.

It will be noted that this ration contains less carbohydrate than is recommended by Dechambre. The use of alfalfa-leaf meal is an innovation in the feeding of dogs, though it is now being used for this purpose to some extent in Britain. Its great value for poultry feeding is well known, and the beneficial results are due mainly to its high calcium content and to its comparative richness in vitamins A and D. It is difficult, however, to understand the incorporation of food of this nature in the diet of a carnivore, and there does not appear to be any experimental evidence demonstrating its utility. No satisfactory explanation has yet been deduced concerning the proclivity of dogs and cats to eat grass. Might it be an instinctive yet abortive attempt to obtain a supply of vitamin A. Gehrken and von Stephanitz[13] point out that while dogs will eat raw vegetables, their digestive organs are not suited to an exclusive diet of such food, and that it should be merely supplementary to other food. They recommend the more liberal use of raw flesh. Indeed, most observers consider that raw meat should form the basis of a dog's diet. Thus Jordanoff[14] says that good raw meat should be the principal constituent of the ration but that it my be supplemented by a variety of plant foods. He recommends the use of filleted fish and states that growing dogs should be supplied with vitamins and calcium.

Vitamin Requirements

Vitamin A.—This accessory food factor has been found to be necessary for adequate growth and for the maintenance of a high health level which increases the power of the body to resist the invasion of pathogenic organisms. Animals nourished on a diet lacking in this vitamin are more susceptible to bacterial infections; hence the factor is often referred to as the anti-infective vitamin. Animals can store considerable reserve supplies of vitamin A in the body.

Under natural conditions of feeding, a dog will get a sufficient supply of vitamin A from muscle, fat and liver, and if it is an omnivorous feeder, such as a scavanger, from a variety of sources. Dog biscuits made from wheat flour do not contain sufficient vitamin A; even wheat flour made from whole meal and reinforced with wheat germ, as many biscuits are, may not contain sufficient for health. Fresh beef and beef fat and horse flesh or horse fat, provided the animals have been grass fed or given an artificial supply of vitamin A, will correct the deficiency in white flour.

The effects of a continued diet of foods deficient in vitamin A are to be noted in experimental xerophthalmia; Steenbock, Nelson and Hart[15] produced it in dogs after 94 days. In pet dogs a condition closely resembling experimental xerophthalmia is not uncommon. Mellanby[16] found that with puppies that had died in an epizootic of bronchopneumonia susceptibility to the disease was closely correlated with a deficiency of vitamin A in the diet. He has also[17] produced a diseased condition associated with degenerated nerve fibers in tracts of the cord by the use of diets rich in cereals, especially in wheat germ, and deficient in fat-soluble vitamins. He ascribed this effect to a nerve toxamin in the cereals which, like the decalcifying toxamin also contained in cereals, could operate only in the absence of a fat-soluble vitamin.

Vitamin B.—The B complex is of particular interest since many veterinarians and dog owners, at least in Britain, believe that deficiency of this vitamin is partly, if not wholly, responsible for that mysterious malady "canine hysteria." Accordingly, it has become fashionable to prescribe the B complex and to fortify dog biscuits with wheat germ. There does not appear to be any experimental evidence linking vitamin B deficiency with canine hysteria (fright disease), but it is well known that the complex is protective against beri-beri and polyneuritis.

Appetite (food intake) is lessened with vitamin B deficiency. A lack of vitamin B_1 leads to disorders of gland function, and

Miyaderda[18] showed that the flow of gastric juice in dogs is greatly reduced or entirely inhibited when they are deprived of vitamin B_1; but Karr[19] claimed that there were no disturbances in digestion and absorption of protein in such dogs. It may be, as has been pointed out,[20] that a decrease in the flow of gastric juice is due to lack of stimulating substances in vitamin-free diets.

There appears to be some evidence in support of the contention that blacktongue in dogs, so-called "Stuttgart disease or canine typhus," is due to a deficiency of vitamin B_2 in the diet. One cannot discuss at length the experimental data in support of the theory, except to say that diets restricted to wheat flour and whole maize have produced experimental blacktongue, according to Akroyd and Roscoe.[21] The experimental studies in this connection are reviewed in the Medical Research Council's Report, "Vitamins," 1932. It may be mentioned, however, that Tscherniak and Romanov,[22] who have drawn attention to an extensive calcification of the tissues in blacktongue, suggest that the disturbance of calcium metabolism may be associated with an excess of vitamin D in the food. Spaulding[7] has noticed the frequency of blacktongue in kennels where the dogs are fed on a "mush" of maize meal one day and rice meal the next. When the diet was changed to a good-quality biscuit these cases ceased to occur. Under natural conditions of feeding, a dog would get a sufficiency of the B complex from liver and heart, though less from muscle.

Polyneuritis has been produced in cats after feeding for 18 days on lean beef that had been autoclaved in sodium bicarbonate; dogs fed on the same diet remained healthy for a month or six weeks but after that period developed polyneuritis, according to Voegtlin and Lake.[23]

As long ago as 1841 Magendie[24] found that a dog lived only 50 days if given white bread, whereas it remained healthy on dark "soldier bread."

Cowgill, Duel and Smith[25] state that a dog's daily requirement of vitamin B is contained in 40 mg of Harris yeast-extract vitamin concentrate.

Vitamin D.—The part played by vitamin D in promoting growth, the proper calcification of bones and teeth, and in preventing rickets is well known. Mellanby's demonstration of the anticalcifying factor in cereals and particularly in oatmeal and wheat germ and the important rôle of vitamin D in neutralizing the factor will be familiar to all interested in the feeding of dogs. While an adequate supply of vitamin D is essential for the well-being of dogs, and particularly for breeding animals, in view of the work of Harris and Innes and of others it is clear that care must be taken to avoid excessive dosage; this is particularly necessary when the calcium and phosphorus supplies are inadequate or unbalanced. (The anticalcifying effect of cereals, e. g., oatmeal, can be neutralized by radiation from a mercury-vapor lamp, the assumption being that irradiation converts the ergosterol into vitamin D.)

Vitamin E.—As is well known this vitamin is necessary for the satisfactory functioning of the reproductive systems in males and females. With natural feeding conditions, i. e., on animal flesh, the dog would get a sufficiency since there is a good supply of it in muscle, liver, heart, spleen, etc. On the other hand, white wheaten flour biscuits contain none, but if the biscuits are made of whole meal, and particularly if reinforced with wheat germ, and adequacy of this vitamin will be supplied.

Vitamin C.—Innes[26] has shown by his experimental work with puppies that the dog does not require this vitamin in its food. He carried out a feeding experiment with eight puppies, eight weeks old, obtained from two litters. Five were placed on a scorbutic diet and three kept as controls; they were killed 147 to 154 days after. Careful histological examinations were made of bones and teeth, and radiographs were made of the long bones. The absence of impairment of growth and of lesions in bones and teeth justified the conclusion that the growing dog does not require vitamin C in its food. The livers of dogs fed on the scorbutic diets were found to contain vitamin C; apparently, therefore, the dog can synthesize vitamin C in its liver.

One may state, then, that the dog's diet requires a supply of vitamins A, B, D and E. An abundance of these will be obtained from fresh meat, particularly liver, heart and the fat of herbivorous animals provided they have been grass fed. Supplemental supplies can conveniently be obtained from cod liver oil or preferably a halibut oil preparation, and yeast extracts. Yeast extract is recommended in the place of cereal germs.

While the deficiency of a vitamin during a long period will produce disease that is recognizable by certain specific symptoms, what is probably of greater importance to the clinician, since it is almost certainly of more common occurrence, is the condition of low-health level caused by deficiencies of minor degrees.

Many manufacturers now incorporate cod liver oil in their dog biscuits. It is a matter of some importance to know whether such biscuits remain vitamin active after they have been scalded, and also if old stocks which are sometimes disposed of by small vendors are still potent. Lössl[27] found that biscuits to which cod liver oil had been added contained sufficient vitamin A and D after they had been kept for several weeks. Nevertheless, it would appear to be a safer practice to purchase plain biscuits and to add cod liver oil as, and when, necessary.

The analytical work for this communication was carried out by my assistant, Mr. A. N. Wilson, B.Sc., A. I. C.

Summary

It is suggested that Dechambre's standard of food requirements for dogs may be accepted as a useful guide as to quantity and proportions.

Some daily rations for dogs, including two from greyhound kennels, were analyzed and compared with Dechambre's standard. A fairly close agreement was noted.

The chemical composition of 27 different kinds of dog biscuits is given, showing great variation. If dogs are to be fed according to a standard, the composition of the biscuits must be known.

As the dog is still a carnivorous animal, his diet must contain a proportion of fresh raw flesh. This is definitely essential for young growing dogs, and raw liver, spleen, and kidney are particularly valuable in this respect. Crushed bones or bone flour should always be given to pregnant and nursing bitches, and also to puppies.

Fresh horse flesh, if obtained from grass-fed animals, is quite as good as ox beef.

Residues from fat-melting factories [rendering works] are not suitable for dogs.

Cooked vegetables are now used extensively as food for dogs, but it is doubtful if this is justifiable.

The diet of all dogs should contain an abundance of vitamins A, B_1, B_2, D and E. Innes has shown that the dog does not require vitamin C in its food.

Literature Cited

[1] Dechambre, P. *Recueil Méd. Vét.*, 1919, 95:220.
[2] Mangold, E. *Nutrit. Abs. and Revs.*, 1934, 3: No. 3, 647.
[3] Lössl, H. *Ztschr. f. Hundeforsch.* 1931, 1:69.
[4] Hudson, R. *Vet. Record*, 1932, 12:224.
[5] Monvoison, A. Le Lait et Les Produits Dérivés. 1925, 3rd Ed., 115, Paris.
[6] Dechambre, P., and E. Dechambre. Bull. Soc. Vét. Pratique de France, 1933, 4:113.
[7] Spaulding, R. H. *Vet. Med.*, 1933, 28:274.
[8] Harris, L. Mariner and Hoskins Research Labs., Chicago.
[9] ——— and Darling, E. A Study of the Growth and Antirachitic Factors in a Canned Dog Food for Dogs, Chappel Bros., Rockford, Ill.
[10] Lössl, H. *Ztschr. f. Hundeforsch.* 1933, 3.
[11] Rubner. *Arch. f. Physiol.*, 1918, 135. Lusk. Science of Nutrition, 4th Ed., 1931, 58.
[12] Whitney, L. F. *Amer. Kennel Gazette*, 1932, May. *Vet. Med.*, 1933, 28:82.
[13] Gehrken and von Stephanitz. *Ztg. d. Vereins f. deutsche Schäferhunde*, 1931, 30:686. *Nutrit. Abs. and Revs.*, 1932, 1:560.
[14] Jordanoff. *Ztg. d. Vereins f. deutsche Schäferhunde, Augsburg*, 1931, 5:200. *Nutrit. Abs. and Revs.*, 1931, 1:277.
[15] Steenbock, Nelson, and Hart. *Amer. J. Physiol.*, 1921-1922, 58:14.
[16] Mellanby, E. *Brit. Med. J.*, 1926, 1:515.
[17] ——— *J. Physiol.*, 1926, 61:xxiv.
[18] Miyaldera. Vitamins, 1932. Med. Research Council Sp. Rep. No. 167, 135.
[19] Karr. Vitamins, 1932. Med. Research Council Sp. Rep. No. 167, 135.
[20] (Vitamins) 1932. Med. Research Council Sp. Rep., No. 167.
[21] Akroyd and Roscoe. *J. Hygiene*, 1929, 23: 483.
[22] Tscherniak and Romanov. *Arch. f. Wiss. u. prakt. Tierheilk*, 1931, 63:436. *Nutrit. Abs. and Revs.*, 1932, 1:574.
[23] Voegtlin and Lake. *Amer. J. Physiol.*, 1918, 47:55.
[24] Magendie. Comp. rend. Acad. Sci., 1841, 13:237. Lusk. Science of Nutrition, 4th Ed., 1931, 496.
[25] Cowgill, Duel and Smith. *Amer. J. Physiol.*, 1921, 57:420.
[26] Innes, J. M. Univ. of Cambridge, Inst. Animal Path., Ann. Rep., 1931, 143.
[27] Lössl, H. *Ztschr. f. Hundeforsch*, 1931, 1:74.

Abstracts

TREATMENT OF MANGE IN DOGS

The Department of Physiology, Medical College of South Carolina [15] has been very successful in curing mange in infected animals and in preventing its appearance in other animals by the use of a low cost dip. The dip is prepared in a barrel by mixing one part of lime-sulphur concentrate and eight parts of water. The animal is immersed to its ears and then released in the pen. The same dip is used repeatedly. No attempt has been made to diagnose the mange species involved, but it is supposed that the sarcoptic form predominated.

* * * *

CECOSTOMY IN THE DOG

A cecostomy technic [16] which includes the making of a valve which either eliminates leakage entirely, or reduces it to a point which permits a long normal life, is described as follows: First Stage. An incision about 4 cm. long is made on the left side at the level of the last nipple lateral to the border of the left rectus muscle and about two inches below the left costal margin. Each layer of muscle and fascia is separated by blunt dissection. The peritoneum is incised and the edges are caught with several clamps. As soon as the cecum has been brought into the operative field, it is kept carefully bathed in warm physiologic saline solution. The cecum is then dissected away with scissors from its mesenteric attachments to the small intestine. The cecum is drawn into the operative wound until it projects about 4 cm. through the body wall. Sutures, penetrating the peritoneum, muscle and fascial sheaths of the body wall and the muscle layer of the cecum, are taken. When these sutures have been placed, the cecum is grasped by its tip and rotated so as to point in the opposite direction. The production of the valve depends on the successful maintenance of this twist and fold by suitable sutures. The tip of the cecum is fastened to the abdominal muscle and fascia in the tunnel under the skin. The remaining edges of the skin incision are then fastened to the top of the cecum. Second Stage: Three to four weeks later, at a point nearest the tip and farthest away from the bend in the cecum, a very small puncture wound is made with the tip of a scalpel. A metal canula is then inserted, an attempt is made to determine whether the opening is in the cecum.

* * * *

IMPROVED TEST FOR CHAGAS' DISEASE

By growing Trypanosoma cruzi on medium prepared according to the method of Bonacci, Kelser[18] has developed a usable antigen for the complement-fixation test in the diagnosis of Chagas' disease (trypanosomiasis in man) and the identification of animal carriers. The medium is prepared by adding 25 gm. of dehydrated bacto-beef to 500 cc. of distilled water and incubating this solution at 55°C for one hour; then, 12.5 gm. bacto-peptone and 3.5 gm. sodium chloride are added, and the waterbath is brought up to the boiling point for about five minutes. The solution is now filtered and rendered neutral to litmus, whereupon 1% bacto-agar is added. The solution is then filtered into Erlenmeyer flasks, or test tubes. Sterilization is accomplished by autoclaving at 12 pounds pressure for one-half hour. Before inoculation of the flasks or tubes, the water of condensation is augmented by the addition of 2cc of a mixture of one part of a 1% sterile dextrose solution and two parts of peptone broth. To prepare the antigen, the culture tubes or flasks are washed out with sterile distilled water. The growth is collected in sterile 15cc centrifuge tubes, and trypanosomes are separated from the fluid by centrifugation. They are then washed once more in sterile physiological saline solution. After all supernatant fluid has been drawn off, two volumes of 50% glycerol in

[15] Kinard, F. W., and Erve, J. V. D. 1936. Control of Mange in Laboratory Dogs. *Jour. Lab. & Clin. Med.* 21:1203-1204.

[16] Cowgill, G. R., and Weinstein, L. 1936. A Technic for Performing a Valvular Cecostomy in the Dog. *Jour. Lab. & Clin. Med.* 22:200-204.

[18] Kelser, R. A. 1936. A Complement-Fixation Test for Chagas' Disease Employing an Artificial Culture Antigen. *Amer. Jour. Trop. Med.* 16:405-415.

physiological saline solution are added. This constitutes the stock antigen. Titration is made a day or two prior of the use of the antigen. In the test, 1½ to 2 units of antigen are used and 1½ units of complement. After one-half hour incubation two units of hemolytic amboceptor and 0.1cc of washed blood cells are added. After incubation for another half hour the result of the test is recorded.

SUSCEPTIBILITY TO ENCEPHALOMYELITIS

Evidence is presented [21] of the susceptibility of the gopher to the virus of equine encephalomyelitis, western type. It is suggested that the gopher and other wild rodents may possibly act as reservoir hosts for the virus in nature.

BIOLOGICAL DIAGNOSIS OF PREGNANCY

The biological diagnosis of pregnancy is at present practical only in the mare.[19] Consistently earlier results can be obtained with blood than with urine. The gonadotropic hormone appears in the blood at a definite interval after productive service. At the most there is a variation of a few days in the time of its appearance, whereas there is considerable variation in the time of the first appearance of estrin in the urine of different mares, and as regards the occurrence of the diagnostic concentration of estrin there may be as much as three weeks or more difference in different mares. When a diagnosis is particularly required earlier than 60 days after conception, and when the services of a veterinarian are readily available for the collection of a specimen of blood, the blood test offers definite advantages. On the other hand, although the urine test does not permit of such an early diagnosis, a negative result 60 days after service still enables the mare to be examined and re-mated without missing a breeding season, while a positive result can also be obtained sufficiently early to allow of definite steps being taken for the management of the brood mare.

For the serum test either mice or rabbits are used as test animals. The Ascheim-Zondek test requires four or five infantile mice. They are injected with 0.2 to 0.5cc serum twice daily for three days. On the morning of the fifth day the mice are killed and the ovaries examined. The presence of hemorrhagic spots and corpora lutea is taken as evidence of the existence of pregnancy. The Friedmann-Schneider rapid method makes use of the rabbit as the test animal. Fifteen cubic centimeter of blood serum are injected intravenously, and the ovaries are examined after 24 to 48 hours. The rabbits used should weigh not less than 1400 grams. Diagnosis is made on the occurrence of ovulation.

For the urine test ovariectomised mice are used. They should not be inoculated with pregnancy urine for at least one week after removal of the ovaries. Such mice can be used for a number of tests, but at least a week should elapse after a previous test before they are used again. Prior to injection the urine is treated with sulphosalicylic acid. This substance is added to the urine until effervescence ceases or in amounts of approximately 1 gm. per 25 cc. of urine, whichever is the greater. The effect of the sulpho-salicylic acid is to precipitate any protein present and to detoxicate the urine. The specimen of urine is then shaken, allowed to stand for a few minutes, filtered and neutralized with sodium bicarbonate, using B.D.H. universal indicator. The mortality in mice from urine treated in this manner is much less than 1%. A positive reaction consists in cornification of the vaginal epithelium. The earliest date on which a positive diagnosis is possible with the urine test is the 48th day of pregnancy. Usually a diagnosis cannot be given until about the 60th to the 65th day, and it may be delayed until the 100th day. The accuracy of this test is over 99%.

The earliest time at which a positive diagnosis is possible with the serum test is 37 to 42 days after conception. The serum method can be used only up to about the

[21] Syverton, J. T., and Berry, G. P. 1936. Susceptibility of the "Gopher" *Citellus Richardsonii* (Sabine) to Equine Encephalomyelitis. *Proc. Soc. Exp. Biol. and Med.* 34:822-824.

100th day of pregnancy. Thereafter the hormone content of the blood decreases and negative results from pregnant mares are likely to arise.

MORCOS' PREGNANCY TEST

A technic for the diagnosis of pregnancy in the human is described by Morcos [20] as follows: Female immature rabbits 30 to 60 days old are used. Bottles having a capacity of 50 cc., containing either 0.5 cc. chloroform, or 1cc ether, are filled with suspected urine. Before injection of the rabbit the bottle is placed in the incubator for two hours to evaporate most of the cholorform or ether. The rabbit is injected intraperitoneally on two successive days and slaughtered on the morning of the fourth day for post-mortem examination. The first dose is 7 cc.; the second, 24 hours later, is 8 cc.; autopsy is 48 hours after the second dose. Urine from pregnant cases causes most evident thickening of the horns of the uterus and brown hemorrhages, three or four, about 1 mm. to 3 mm. in diameter. The test is applicable 14 days after the last menstruation. Chemicals in the same dilution plus normal urine causes no change. Ether added to urine is preferable to chloroform, the latter being more irritating to the tissues of the animal. Since veterinarians customarily have facilities for caring for laboratory animals and have the necessary skill for making the test it is often expedient and profitable for them to make pregnancy tests for physicians in the community.

INFECTIOUS PARALYSIS OF CATS

Infectious bulbar paralysis is transmissible to cats by enteral and by parenteral infection.[17] The former mode of transmission seems to be the natural avenue of infection. The symptoms observed following artificial alimentary infection resemble those seen in natural outbreaks of the disease, while the symptoms of artificial parenteral infection do not resemble those seen in natural outbreaks.

The symptoms of alimentary infection with bulbar paralysis in cats are: anisocoria (unequal dilation of the pupils), unilateral mydriasis, photophobia, blinking, closure of the eyelids; painful groaning; vomiting continuously for one to two hours, accompanied by salivation. As the disease progresses, the respiration becomes accelerated and superficial; agony and, finally, death result in six to ten hours.

Nicolic brings circumstantial evidence to prove that this disease is transmissible to man. The avenue of infection for man is not known definitely, but it is believed that it is likewise via the alimentary route.

EFFECTS OF DIGITALIS

Following the administration of digitalis to the normal dog, former investigators had found a decrease in blood volume;[22] it was believed that the drug acts primarily upon the heart and that the decrease in blood volume is the consequence of the heart becoming small. Other experimenters expressed the opinion that the decrease in blood volume is the result of the constricting action of the drug upon the hepatic vein. In recent years abundant evidence has been forthcoming to show that the whole story of the action of digitalis in the body cannot be deduced from experiments upon isolated organs, but rather upon the interpretation of the changes that occur in the intact organism after readjustments have taken place in the body as a whole. Consequently, Moore and Kinsman subjected the pharmacologic action of digitalis in the body of the dog to further investigation. The results of their experiments led them to believe that in some cases digitalis exerts a peripheral action to cause an increase of circulating blood in the greater circulation, though not necessarily associated with changes in the flow per minute, venous pressure, or velocity of blood flow.

[19] Anderson, J. 1936. The Biological Diagnosis of Pregnancy in Animals. *Vet Jour.* 92:200-211.

[20] Morcos, Z. 1936. Pregnancy Test. *Vet. Jour.* 92:222-224.

[17] Nicolic, M. 1936. Beitrag zur Frage der Ubertragung der infektiösen Bulbär-Paralyse in der Natur. *Veterinarski* Arhiv 6:31-42.

[22] Moore, J. W., and Kinsman, J. M. 1936. Studies on the Circulation: The Dye Injection Method. *Jour. Labor. & Clin. Med.* 22:165-172.

NEW TISSUE STAINING METHOD

A simple, rapid, and apparently foolproof staining method for rapid tissue diagnosis is as follows:[23] A section is cut from the block on the freezing microtome in the usual manner and floated from a dish of water to a slide; the excess of water is wiped from the slide with a soft towel, care being taken not to touch the section. A drop of 1:200 (0.5% of brilliant cresyl blue in normal saline solution is then dropped on the center of the section which stains it instantly, a cover slip is then placed on the stained tissue and the slide given a gentle tap downward on the finger to fix the cover slip in position, and the tissue is ready to be examined.

AN IMPROVED HORSE-DRAWN AMBULANCE

An improved light type, four-litter, patient vehicle drawn by two horses, built and tested by the Medical Department Equipment Laboratory was sent to the First Medical Squadron for trial.[25] From the experience gained over the particular terrain traversed in these tests, superiority of experimental ambulance over present type of animal drawn ambulance for service in the field was noted in the following points: (1) It requires but half the number of animals. (2) It is much easier for two animals to pull the experimental ambulance loaded than it is for four animals to pull the standard ambulance loaded and (3) the comfort of the patient in the experimental ambulance is infinitely greater. This latter was the most striking difference noted in all tests. There is no exaggeration when it is stated that able bodied soldiers were actually injured while riding on the litters of the standard-type ambulance, while those in the experimental ambulance rode in comfort.

The ultimate use of animals for motive power in the army has not yet been decided. Should they be retained, the ambulance here reported on possibly represents in basic design a solution of the problem for the need of a thoroughly efficient and dependable front-line, cross-country, ambulance.

[23] Humphrey, A. A. 1936. A New Rapid Method for Frozen Section Diagnosis. *Jour. Labor. & Clin. Med.* 22:198-199.

[25] Weaver, J. U. 1936. Report of Field Test of an Experimental Animal Drawn Ambulance. *The Military Surgeon* 78:81-92.

FUNCTIONS OF A VETERINARY CORPS

To acquaint the uninformed of the functions and necessity for the existence of the United States Army Veterinary Corps, and to discount the opinion that when the army is fully motorized, the services of the Veterinary Corps will no longer be needed, McKim gives a brief summary of the history and an elaboration on the importance of the Veterinary Corps.[26] The duties of the Veterinary Corps include: Meat, meat-products and dairy inspection; care, treatment and hospitalization of animals; laboratory service; breeding and purchasing; forage inspection; training of personnel, commissioned and enlistened and administration.

Until there are better state laws governing food sources, the army must protect its personnel by a rigid food inspection. The training now being given in the veterinary laboratories of the army will ultimately be the source of great assistance in controlling contagious and infectious diseases which always run rampant in wars if proper medical organization is not available. In addition to the Chief of the Veterinary Division, S.G.O., the tables of organization provide for: army veterinarians, corps veterinarians, division veterinarians, meat and forage inspectors, as well as commanding officers for veterinary general hospitals, veterinary evacuation hospitals, veterinary companies in medical regiments and other veterinary detachments.

BEFORE THE DAYS OF YEAR-AROUND FRESH FRUIT

The rheumatism that elderly folk used to complain of toward spring is now believed to be mild scurvy due to lack of vitamin C in the winter diet.—*S. N. L.*, 30:806.

[26] McKim, O. E. 1936. The Veterinary Corps: Its Origin Functions and Importance. *The Military Surgeon* 78:204-211.

HUMAN CARRIERS OF BR. ABORTUS

Brucella abortus was recovered from 2 of 219 stools obtained from patients who were not suspected clinically of having undulant fever.[27]

Guinea pig inoculation of the stool sediments was substituted for the plate culture method of Amoss and Poston.

Brucella abortus, when mixed with human feces and stored at 8° C., remained viable for at least 150 days.

The foregoing reminds one of the comment of Prof. W. L. Williams about driving the cow infected with *Br. abortus* away to slaughter and leaving behind on the farm a horse, a few pigs, some chickens and the farmer himself infected with the same organism.

* * * *

NEW METHOD FOR STAINING

In an effort to overcome obstacles in certain staining methods Gelarie[24] developed the following staining method: The material to be examined is smeared on the slide in a thin layer and allowed to dry in the air. Cover with fixing solution (2.5 gm. of recrystalized zirconyl chloride dissolved in 100cc. of 10% sodium chloride solution), allow to stand five seconds and then wash with water. Then place a few drops of a 10% solution of recrystalized citric acid in distilled water, allow to remain for ten seconds and wash again with water. Now, a few drops of the straining solution (0.25 gm. of gentian violet dissolved in 100cc of N/10 sodium lactate solution. The pH of this mixture should be approximately 8.4) are placed on the slide, allowed to remain for 30 seconds and then washed off with water. This is followed by momentarily covering the smear with a few drops of a complex mercuric iodide solution (0.5 gm. of mercuric iodide dissolved in 100cc of 0.5% potassium iodide solution) and again washing with water. The slide is then dried with filter paper and examined under the microscope.

[27] Goldstein, J. D., Fox, W. W., and Carpenter, C. M. 1936. Recovery of Br. Abortus from the Stools of Healthy Carriers. *Amer. J'n'l of Med. Sc.* 191:712, Abst. in J'nl of Lab. and Clin. Med. 23:1.

[24] Gelarie, A. J. 1936. A New, One-Minute Method for Staining Spirochetes, Spirilla, Spermatozoa, and Related Organisms. *Jour. Lab. & Clin. Med.* 21:1065-1069.

Book Review

Dog and Dogs. The Story of Man's Constant Companion. By Joseph Edward Harry, Ph.D., Professor of Greek Language and Literature at Bard College, Columbia University. In addition to this work he is also the author of many books on Greek literature. 315 pages. Cloth bound $2.50. D. Appleton-Century Co., New York and London.

While this book is written primarily for the dog owning public, and especially for the millions who are affected by a deep love of dogs, it should likewise appeal to all who are engaged in the welfare of our four-footed friends. The original publishers of this book retired from business, and this is a reissue as the present publishers state "in response to an insistent demand." Professor Harry is a scholar as well as a dog lover and in his studies of the languages he has translated many interesting stories of the dog in the history of numerous countries, both ancient and modern. The early chapters trace the history of the dog from his first appearance in legend to the present day, a span of over 5000 years. Ancient breeds are described and the connecting link shown to those we have today. Most of the book is devoted to a vast and interesting amount of information about dogs in art, in religion, in war and in literature. Professor Harry tells of the many superstitions, customs and proverbs that surround the dog, and brings some of the more celebrated dogs of history into the limelight with descriptions that make of them just as important personalities as the great men of the ages.

In short this is a fine bibliography of the dog and dog lore. It is interesting reading to all who meet dogs in their every day life, as it will add new pleasure to the reader from the knowledge that the author has so painstakingly assembled from all countries and all ages.—*H. J. M.*

Horseshoes of Interest to Veterinarians. By Henry Asmus. Department of Horseshoeing, New York State Veterinary College, Ithaca, New York. 29 pages, illustrated. Published by the Author. $1.00.

The pamphlet gives a description of various horseshoes for healthy hoofs as well as for defective hoofs and for several kinds of lameness, together with 164 illustrations of these shoes The information contained in these pages will be found very useful to the general practitioner as well as to the specialist on lameness in the horse.

* * * *

The Saint Bernard, by J. H. Fleischli, president, St. Bernard Club of America. 110 pages; illustrated. Judy Publishing Company, Chicago, 1936. $2.50.

Fifty years ago this winter, a telephone was installed at the Saint Bernard Hospice, high up in the 8000 foot pass in the Alpine mountains which leads from the Canton of Valais in Switzerland to Aosta in Italy. Since then, whenever in winter time a traveller has left the last village on either side of the frontier to cross the pass, the villagers have telephoned to the hospice and two monks have set out with their St. Bernard dogs to serve as guides. In the course of time the popularity of this noble breed has spread to all countries, including the United States.

The monograph is divided into ten sections: Origin and history of the St. Bernard; history and development of the St. Bernard in America; the nature of the St. Bernard; official St. Bernard standard and its interpretations; principles of St. Bernard breeding; mating and whelping of St. Bernards; training the St. Bernard; care, health, kenneling and feeding of the St. Bernard; the St. Bernard and dog shows; efficient and profitable kennel management.

The author has caught the peculiar spirit and romance associated with the St. Bernard dog. He has presented his subject in a manner that distinguishes this breed from all other dogs. He has shown the value of the St. Bernard dog for the present day home. In addition, certain fascinating and thrilling incidents in the lives of members of this breed are very entertainingly told.

There is much of interest to the veterinarian in Fleischli's book. The dog practitioner's library should contain a wide selection of general books on the dog, and especially books on the various breeds of the dog. This book can be well recommended to veterinarians. It appears unfortunate to the reviewer that the price should have been set so high. Books of this size find a wider market at $1.00 per copy.

* * * *

VETERINARY PUBLICITY

Over 1,000 newspapers, 10 farm journals and many leading radio stations will carry the message of modern veterinary service to the public in 1937, under the sponsorship of the Associated Serum Producers, Inc., according to augmented plans laid at a meeting in Chicago on December 3. The campaign proved so successful last fall that all members of the Associated Serum Producers voted to continue it through the fall of 1937 and to enlarge its scope in several departments.

One new activity voted at Chicago is a series of nine radio talks on the subject of livestock health, to be launched immediately over leading stations, throughout the hog-producing states. The first of these programs was inaugurated over Station KFAB at Lincoln, Nebraska, Dec. 8, 1936, with Col. Robert J. Foster, president of the American Veterinary Medical Association, doing the broadcasting. Subjects of the radio talks include: The Veterinarian and His Place in the Community, the Prevention of Hog Cholera, Swine Flu, Bot Control, Similarity of Symptoms in Swine Diseases, and other topics dealing with livestock health and the important part the veterinarian plays in helping the livestock producer to safeguard his profits.

The programs may be heard over Station KFAB each Tuesday from 11:10 to 11:15 A. M., Central Standard Time. The complete list of stations in all states will be announced soon.

In addition, the producers' campaign will be extended to include spot announcements over leading stations at spring farrowing time urging the farmers to have their young pigs immunized against cholera.

The educational campaign in newspapers has been so successful that the producers voted to extend the newspaper list to 1,000 papers, who will receive special news releases on livestock health programs bi-weekly throughout the coming year. The producers also voted to increase to 500 the list of special papers who will receive the series of articles on "Health Hints for Livestock," similar to the health advice columns on human ailments being carried by many papers at the present time.

The 1937 campaign will also embrace paid advertising in ten leading farm journals during the

months of March, April, May and June, urging farmers to have their pigs immunized against hog cholera, and to have the work done by graduate veterinarians only.

The tremendous interest which the educational campaign has aroused was shown at the Chicago meeting in the series of exhibits, which included hundreds of newspaper clippings from all the major hog-producing states. These exhibits, showing the widespread use which papers are making of articles issued by the Associated Serum Producers, will be presented this winter at leading veterinary conventions so that members of the profession may examine them at first hand.

This is the most extensive campaign ever undertaken on behalf of the profession. The news material, the advertising, and the radio all stress the importance of consulting the veterinarian on all matters of livestock health. It is believed that by bringing the farmer in closer contact with his veterinarian, and by educating him to a larger use of his veterinarian's services, a great good will be accomplished.

"The veterinary profession has been slow to adopt any means of advertising itself, . . . Possibly as a result of this, no other service of equal importance is so little known or so lowly valued by the general public."—*Com. on Public Relations, A.V.M.A.* The Associated Serum Producers, Inc., are doing their full share to overcome this handicap to the progress of veterinary medicine.

The following companies are supporting this campaign:

Allied Laboratories, Inc., Blue Cross Norden Serum Co., Corn Belt Serum Company, Fort Dodge Laboratories, Inc., Grain Belt Supply Co., Inc., Jensen-Salsbery Laboratories, Inc., Liberty Laboratories, National Laboratories, Inc., Norden Laboratories, Pitman-Moore Co., Platte Valley Serum Co., Sioux City Serum Co., Sioux Falls Serum Co., The Columbus Serum Co., The Corn States Serum Co., The Gregory Laboratory, The Royal Serum Co., The Southwestern Serum Co., and The United Serum Co.

GERMANY IS BUYING MULES

Big mules, weighing from 1500 to 1600 pounds, are being bought for farm use in Germany, and smaller mules, averaging around 1000 pounds, are being bought for army use there.

Arkansas, Louisiana, Mississippi, Alabama, Georgia, Florida and North and South Carolina will need to buy more than 195,000 mules before the next work season starts, for they raise very few and their replacement needs are heavy.

North Carolina tobacco planters buy the choicest mules today. These stand about 15½ hands and weigh from 1100 to 1200 pounds. Good cotton mules going to the Carolinas and Georgia are the next best, and these range from 900 to 1200 pounds. Those most desired are from 61 to 62 inches tall and weigh from 1000 to 1100 pounds.

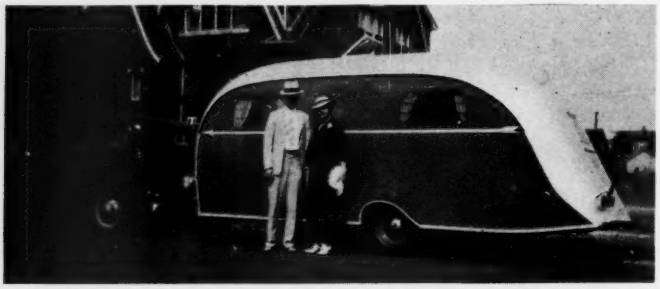
Mules are purchased by shippers mainly in Illinois, Iowa, Missouri, Nebraska, Kansas, Minnesota and North and South Dakota, though some come from California, Oregon and Colorado. They are shipped to East St. Louis and other great terminal markets, where they are resold, usually at auction, to dealers from the southeastern states, who ship them south and dispose of them to small dealers or direct to plantation owners. Prices are from $10 to $40 per head higher than 3 years ago.

"There is an excellent future in mule production for farmers who understand how to work and care for brood mares," stated Mr. Sparks of the Sparks Horse & Mule Co. of East St. Louis, "for there is a nation-wide shortage of mules, and because of the extreme scarcity of jacks this shortage cannot be overcome in less than 10 years. For that period at least, prices for mules will be higher than for horses, and men who raise them, using mares to do their work and to raise mule colts, are proceeding on a sound financial basis."

LAUTER, NEW RESEARCH DIRECTOR OF R. J. STRASENBURGH CO.

Dr. W. M. Lauter, of the Research Department of E. K. Squibb and Sons, has been appointed Director of the enlarged Research Department of the R. J. Strasenburgh Company, Pharmaceutical Chemists, Rochester, N. Y.

Coincident with Dr. Lauter's appointment as Research Director, R. J. Strasenburgh Company has recently doubled the size of its Research Laboratories. New facilities have been added for testing the efficiency of new products which are being continually developed in this department. Doctor Lauter has had wide experience in the development of pharmaceuticals.



Dr. and Mrs. E. J. Frick, Manhattan, Kansas, and their automobile house-trailer. This photograph was taken at Columbus, Ohio, during the A. V. M. A. meeting there in August, 1936. The Fricks are inveterate travelers by trailer.